FACULTY INNOVATION TOOLKIT

From interactive video to digital textbooks, these tips and tricks will help instructors innovate with technology in the classroom.
What to See at Campus Technology 2016

At this year’s Campus Technology Conference in Boston, learn about wearables, gamification, solutions-based IT and the future of technology in higher education.

WE ARE ABOUT two months away from the annual Campus Technology Conference (Aug. 1–4 in Boston), and there’s a lot to look forward to this year. My personal list of highlights:

Problem-Solving Through Gamification in Higher Education
Scott Reinke, coordinator for the Ball State Achievements program at Ball State University (which received a 2015 Campus Technology Innovators award), is conducting a hands-on workshop on the elements of game design — a terrific opportunity for anyone interested in gamification as a tool for teaching, guiding and encouraging student success. He will also touch on gamified models outside of the games industry, such as loyalty programs, donation drives, crowdfunding, social media and more.

Assessing Emerging Technology and Futures Capacity for Your Organization
Consultant and futurist Bryan Alexander will reveal the tools of his trade, presenting methods to help identify and assess the current trends most likely to shape the future of higher education. Always an entertaining and enlightening speaker, Alexander is also creator and host of the Future Trends Forum, a weekly video chat with ed tech thinkers that has delved into topics such as credentialing, venture capital in higher ed, open education resources and more. (Don’t miss this issue’s “Redefining Student Success in a Digital Ecosystem,” our recap of Alexander’s recent forum chat with Virginia Commonwealth University’s Gardner Campbell.)

Wearable Technology Innovations
For years, Emory Craig, director of e-learning and instructional technologies at The College of New Rochelle, and ed tech strategist Maya Georgieva have followed the cutting edge of wearable technology in the learning environment. Prepare to be amazed as you learn about the latest improvements in wearables, including more accurate physical and mental tracking, wearable jewelry tech and new ways of communicating with technology.

Future Learning in Higher Education
Get some insight into Google’s attitude toward technology and education in the 21st century: Jamie Casap, the company’s chief education evangelist, will explain how changes in demographics, technologies and educational models are fundamentally altering the possibilities of higher ed.

Confessions of a Solutions-Based IT Organization
Thomas Hoover, associate vice chancellor and chief information officer at the University of Tennessee at Chattanooga, is not one to shy way from challenges. His institution’s IT department has been through multiple reorganizations over the last three years, all in an effort to become a solutions-based operation. Hoover will share his team’s failures and successes along the way — and the takeaways that every IT shop can learn from.

I would be remiss not to mention the CT2016 keynotes — Georgia Tech’s Richard DeMillo, MOOC pioneer Stephen Downes and digital learning expert Amy Collier — sure to set an inspiring tone for the whole event. Plus, in a ceremony on Aug. 3, we will recognize this year’s recipients of the Campus Technology Innovators awards: 11 higher education technology leaders whose innovative work is making a difference at their institutions. Don’t miss it!

Continue the conversation.
E-mail me at rkelly@1105media.com.
DIGITAL LEARNING RESOURCE. Northwestern University (IL) has launched a new Digital Learning website to showcase the innovative practices of campus faculty and provide information for those who want to implement digital learning. Resources on the site include: information about getting started with online and blended learning; training events on specific topics related to digital learning; information about requesting active learning spaces on campus; links to the university’s massive open online courses; and more. Read the full story online.

MAKING MOOCs SOCIAL. Students may be more likely to stick with massive open online courses if they use Facebook, according to a study from Pennsylvania State University. Researchers found that open course students were more engaged on Facebook groups and preferred interacting more on the social media site than through the course tools. “Social media may provide another communication channel for the students,” said Saijing Zheng, a former doctoral student at Penn State and current research scientist at Microsoft, who led the study. “Current MOOC platforms do not include collaborative features for students to work together or good conversation channels between students and teachers.” Read the full story online.

OUTSOURCED NETWORK SERVICES. Faced with the need for a robust network infrastructure to accommodate the variety of connected devices students bring to campus, as well as the demands of new digital learning and administrative applications, Ranger College (TX) has implemented an advanced digital learning environment using cloud-managed wired and wireless network services. The rural community college turned to outsourcing to solve the problem, choosing Adtran ProCloud Services for its wireless and local area network services, as well as the company’s professional services for initial site surveys, installation, student and staff help desk, alert monitoring and full system management. Read the full story online.

SCHOOLING WATSON. Eight North American universities will be working with IBM to train Watson on cybersecurity. The artificial intelligence system has already begun “learning” security research related to spam and phishing attacks and documented vulnerabilities compiled over the last two decades by the company. Students at the institutions will help teach Watson the “language” of cybersecurity by annotating security reports and data and loading those into the system. Among the universities participating are California State Polytechnic University, Pomona; the University of Waterloo; and the University of Maryland, Baltimore County. Read the full story online.

IN-PERSON SUPPORT. Udacity’s Nanodegree and Nanodegree Plus students can now access in-person study sessions through Udacity Connect. UConnect students in Los Angeles, New York City and San Francisco will have access to physical learning centers where they can network, interact and collaborate with others. They will meet once a week with a mentor and receive “face-to-face” guidance with goal setting and hitting key...
milestones,” according to a news release. Read the full story online.

DIGITAL CRED. Only a quarter of hiring professionals in a recent study use digital credentials in their recruitment or hiring processes. And just over a third (36 percent) have any knowledge of the topic. The survey was done among 130 HR, recruitment and talent management professionals by Accreditrust Technologies, a company that authenticates digital credentials through its program True-Cred. The majority of those surveyed still rely primarily on “high stakes” credentials, including a college or university degree, a professional certificate or license and work history on a resume. Read the full story online.

ANALYTICS SUCCESS. A Strayer University pilot testing out the use of an analytics infrastructure to improve

PRODUCT ROUNDUP

Dropbox Education allows faculty, staff and graduate students to collaborate on files while IT administrators control security — all at a reduced price for education institutions. Read the full story online.

The latest version of Smart Technologies’ Smart kapp iQ display board has software built into the interactive display, so that users have no need for an external computer. Read the full story online.

Turnitin has introduced Turnitin Feedback Studio, the latest version of its anti-plagiarism product that will emphasize feedback, ease of use and accessibility. Read the full story online.

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Files are stored on a secure server instead of on removable media

MP4 files can be viewed using standard media players
student outcomes has reported positive results. The institution is working with analytics software from Civitas Learning to monitor student behavior and engagement; pinpoint struggling students; and target outreach. In one 11-week experiment, compared to a control group, the students most at risk experienced a 5 percent increase in attendance, an 8 percent decrease in course drop rate and a 12 percent improvement in course success. Read the full story online.

**Webinars on Demand**
Register for the latest Campus Technology webinars online.

**Today's Public Sector Data Center: Enabling Modern Service Delivery Through Innovation and Efficiency**
Learn how to build a robust data and compute infrastructure to meet the demands of technological change. Sponsored by Lenovo

**Optimizing IT on Campus**
Three universities share tips for maintaining a positive learning environment, an efficient back-office platform and streamlined process for updates and resolving IT issues. Sponsored by TeamDynamix

**Why Moodle Matters**
Explore the history of the LMS market, the importance of open source and what Moodle has to offer. Sponsored by eThink Education

**RISKY BUSINESS.** In order for teenagers to learn how to handle the big risks of internet usage, they need to face a small amount of online risk, according to a study from Penn State. Researchers had teens keep a diary on the types of online risks they encountered, and then asked follow-up questions to gauge their perceptions of the experience. “Resilience theory suggests that lower level risk experiences may actually help inoculate teens from higher risk situations by teaching them to avoid or cope with future risk experiences,” the researchers wrote. Read the full story online.
Taking Competency-Based Credentials Seriously in the Workforce

Companies like AT&T and Google are expanding their partnerships with online education providers, creating new educational pathways to real jobs.

IT SOUNDS cutting-edge, but the concept of a competency-based education that results in an institution-agnostic microcredential isn’t new. For well over a century, industries have worked with colleges and universities through various types of extension programs to salt the workforce with better-qualified candidates. But in the Age of the Internet, for-profit online education providers such as Udacity and Coursera have tweaked that model by collaborating with companies to develop programs tailored to their specific needs.

AT&T was one of the first companies to work with the new generation of online education providers to develop a credentialing program designed to fill a specific staffing gap. In 2014, the telecom company was in the market for “a ton” of entry-level front-end web developers, according to Udacity’s then COO (now CEO) Vish Makhijani. “They knew exactly what kind of person they needed, so we knew exactly how to build a curriculum to generate those competencies,” he said in an earlier interview. Together the two companies created the Front-End Web Developer Nanodegree program, Udacity’s first branded microcredential. (“Nanodegree” is trademarked.)

“We worked with Udacity to develop curriculum based on tangible hiring and training needs,” said John Palmer, senior vice president and chief learning officer at AT&T, in an e-mail. “Our teams collaborated on determining what skills we needed now to address the needs of our business, but also what skills would be needed five to 10 years from now — not just at AT&T, but at other tech companies.”

Palmer believes that such competency-based programs will help AT&T and other companies “widen, develop and diversify the talent pipeline to address the shortage of current and future employees with technology skills.”

Udacity currently offers 16 tech-focused Nanodegrees ranging from a basic introduction to programming to an advanced program in machine learning engi-
neering. The list of companies collaborating to develop and maintain those programs includes Facebook, MongoDB, GitHub, Amazon and Google, among others. AT&T collaborated with Udacity to develop three of those programs, but Google has been the most frequent collaborator to date. The company has worked on seven programs, including the enormously popular Android Developer Nanodegree.

While the Front-End Web Developer Nanodegree created with AT&T is an example of a program originally tailored to a specific staffing need, the Android developer program was, from the start, more broadly aimed at expanding an ecosystem, explained Peter Lubbers, senior manager on Google’s Developer Relations Team.

“My team’s mission is to educate and inspire developers, globally, around our platform,” Lubbers told Campus Technology. “We want to reach as many developers as we can, and these programs provide an effective and efficient way to do that.”

About three years ago, Google launched its own experimental online course designed to teach the HTML5 markup language to web developers. It was a hot topic, Lubbers recalled, and the free course drew 50,000 students within the first two months. The company continued to experiment with online courses, but eventually concluded that it needed “a more holistic narrative” that would leave students with the ability to do an actual job.

“We felt we needed a curated, well-lit path through all this great training material we had developed,” Lubbers said. “About the same time, Udacity was developing their Nanodegrees, and we just came together.”

Google unveiled the Android Developer Nanodegree program at its annual I/O conference in May 2015. “It was designed to get people to use the best practices — the tips and tricks and...
battle-tested procedures — we need them to know to build high-quality apps," Lubbers said, “but not necessarily so that they can work at Google. Our main goal is to get high-quality Android apps into the ecosystem.”

About 10 graduates of the one-year-old Android Developer Nanodegree program are currently working at Google, Lubbers said.

Evidence that the enterprise at large is embracing these kinds of competency-based programs is mounting. One dramatic example is Flipkart, India’s largest online marketplace, which announced in January 2016 that it would begin hiring students based on their Nanodegree projects alone. No resumes. No in-person interviews.

“They did a detailed review of what our students were learning in the Android Developer program and got very excited about those skills,” Makhijani said. “And they said, interviewing isn’t really a great way to evaluate people anyway, so we might as well just look at the work they did and take it from there.”

Flipkart has partnered with Udacity to gain access to student projects and profiles.

“The kind of disruptive work that we do at Flipkart demands a world-class talent pool and we are constantly on the lookout for experts who can solve the problems of Indian consumers,” said Flipkart CTO Peeyush Ranjan. “The conventional hiring process often comes down to the performance of the candidate on that specific day, which may not be a true reflection of their skills and temperament.”

To maintain such a high credibility level, the collaborating companies are putting significant resources into developing and updating these programs. Google has invested approximately $4 million in the development of three core Nanodegree programs (Android Developer, Senior Web Developer and Tech Entrepreneur). Lubbers said that 1.2 million students have enrolled in these courses, with new students enrolling at a rate of 2,500 daily. The company has also contributed its expertise to the development of four other Udacity programs.

According to AT&T’s Palmer, approximately 11,000 students, including more than 1,000 AT&T employees, have enrolled in microdegree programs co-developed by the company. AT&T is currently working with Udacity to provide 1,200 Nanodegree scholarships, he noted, through organizations such as Year Up. To date, more than 200 scholarships have been awarded, he said.

AT&T has reserved up to 100 internships for graduates of these programs, Palmer said, and the company began hiring for those internships last summer. Several of the interns started full-time positions at AT&T this year.

“Learners earning Nanodegree credentials will be strongly considered when there is a potential job match at AT&T,” Palmer said. “Skills obtained through the Nanodegree program meet AT&T educational requirements for certain entry-level technical positions. Where AT&T has openings for those skills, applicants will compete with other candidates with comparable education for those positions.”

AT&T has also collaborated with Georgia Tech and Udacity to develop the first Master of Science in Computer Science delivered completely online through the massive open online course (MOOC) format. More than 3,000 students are enrolled as of the Spring 2016 semester, compared to about 400 at the start of the program in January 2014, Palmer said. This past December, the program produced its first graduating class of 18 students, including three AT&T employees.

AT&T has high hopes for the future of competency-based education in the hands of this generation of online providers, primarily as a complement to — but not a substitute for — traditional education, Palmer said.

“The Nanodegree program and others like it are new educational pathways for learners to further their education and get high-quality post-secondary training that prepares them for the jobs of the future,” he said. “We’re leveraging technology, relationships and social innovation to help all students make their biggest dreams a reality.”

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Redefining Student Success in a Digital Ecosystem

Retention and graduation rates may be good indicators of a college or university’s success, but they have little to do with students' personal development as connected learners and contributors to the digital commons.

WHAT DOES STUDENT success mean in a digital ecosystem? The most prevalent measures involve retention and graduation rates — students pass their classes, move through the curriculum and ideally graduate in four years — but those “institutional outputs” are the lowest-common-denominator definition, according to Gardner Campbell, special assistant to the provost and associate professor of English at Virginia Commonwealth University. Campbell took part in a recent Future Trends Forum video chat hosted by consultant and futurist Bryan Alexander to share his thoughts about how higher education might rethink ideas of student success in a digital age.

While graduation rates are the type of success that registers on university dashboards, their influence is pernicious, said Campbell. “Whenever you are in a system in which institutional outputs and the single individual private goods (the degree you earn) become fatally interwoven, you get into a very strange situation in which success of the individual is defined in terms of institutional outputs,” he explained. And when the need for institutional outputs drives the definition of what success is for students, the measures of success can become corrupted, Campbell noted. There are many ways to ensure people are successful in their coursework, he added, including grade inflation. “It leads to teachers who are deathly afraid of giving anything lower than a ‘B’ or ‘C’ because that gums up the student success works.”

“In a digital ecosystem, we are talking about shared private goods that contribute to a public good,” Campbell continued. “That is what we need to emphasize if we mean to have meaningful civic engagement in this medium in the years to come. If we don’t, we are not going to be in good shape as a polis, as a democracy. We won’t have what I think of as truly lasting student success, which is effective participation in this digital commons or in the largest commons of all, civilization.”

Campbell described his conception of learning in a digital commons as open, participatory and connected learning. “It is different from just all the apps on my smartphone,” he said. “It is something we all have a stake in and should all recognize we have a stake in. We should all be contributors to that digital commons as well as consumers...
ED TECH TRENDS

of what is open now and what may increasingly be behind paywalls in the future," he said. "It is a digital commons we are all nourished by and must contribute to."

**Institutional vs. Student Success**

When asked if higher education is subsuming the needs of the students to the good of the institutions, Campbell responded with an analogy. Americans used to believe that if it is good for General Motors, it is good for the country, he said. Similarly, we might think that if the retention and graduation markers in the particular institution are high, that must therefore mean we are doing something right as far as the students’ own good. "And I hasten to add that that may be true," he pointed out. "No doubt, often it is true. But I do think institutions, and not just in higher education, tend to define their success as an institution in terms of the fact that they have been sustained as an institution."

He described a chain of mutual dependencies around this idea of success: "The problem in higher education becomes that, like the U.S. Mint, we make our own currency. We’re the ones who assign these grades; we are the ones who define what success means; and we are the ones who can double down on various measures of success that may have very little to do with deep learning, the transfer across domains, and nothing at all to do with the digital ecosystem, which by and large higher education has turned its back on."

The digital ecosystem is rejected by much of higher education in part because we can’t just mint our own money in that medium, he said. "In an open, connected, participatory culture, we have a whole host of voices out there who may not give a tinker’s cuss for the comma splice because it was an interesting blog post. And they may not be at all interested in a very well polished five-paragraph essay posted as if it is a blog post that would nevertheless get a good-student certification from a writing teacher."

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A Problem of Scale

Campbell talked about many of the challenges higher education has faced in its attempts to scale up over time. "We have had to scale up massively over the last century and we have no good way within higher education as a closed community to scale up," he said. "The expert guiding the learner becomes more detached from that essential relationship; more of the assessment becomes transactional and we begin to speak of dashboards. Also, external audiences begin to intrude, probably because we have started to lose some trust." For example, boards of regents want to see evidence of results. "Inevitably we try to find indicators that can be understood very quickly by a group of concerned yet busy people who need to know within 45 minutes four times a year how we are doing. That inevitably leads to certain oversimplifications, sometimes engaged in with the best of intentions. But you begin to debase the currency because the complexity goes down."

It used to be that a certain kind of personal formation was considered part of the duty of higher education, Campbell noted. By abandoning that idea of personal formation in favor of a polytechnical approach — focused on specific kinds of workforce preparation skills or competencies — we end up with something quantified in ways that will lead to a devaluing of the experience, he said. "And when that has happened, it is not clear to me we can sustain any of the things that most of us who work in higher education continue to treasure," he stressed. "We are in some respects a little sequestered, a little abstracted from the daily press of business. We are afforded an opportunity to consider who we are and what type of world we would like to build. There is no other sector in society that affords that opportunity. And I fear that higher
Personal Outcomes
Alexander asked what personal formation might mean as a success measure if we imagine an academia deeply involved with the internet.

Campbell said he doesn’t like to think in terms of learning outcomes because he sees most of the language as reductive, which drives reductive assessments. But the types of outcomes he is looking for involve personal inter-
est, curiosity, awe and confusion. “One of the outcomes I would seek is an increase in the capacity for interest, both in breadth and depth. There are certain dispositional markers we can see, and there are profound opportunities for learners to demonstrate that increase.”

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asked what should go into a learning portfolio, Campbell said that among other things, it is vital that there be some indication of unscripted connections across the work included in that e-portfolio. Many students may not be disposed to reflection, but giving specific instructions about reflection is going to produce compliance, not true reflection. “I want room for things that are not simply complying,” he said. “I think it is important to encourage students to make connections — by that I mean hyperlinks on the web across the courses they are taking. The interaction is not defined as just the student interacting with the teacher, but the students as a community of learners indicating their interest and the relevance of what they are learning.”

Campbell said he is not talking about an e-portfolio, per se, but a realization of e-portfolio practices. “I say practices instead of e-portfolio because as soon as I say e-portfolio, people will say, ‘Are you using Digication or this product or that product?’ The key to the kind of personal formation I am talking about is dispositional. We have a lot of talk about knowledge and skills, but there is a certain disposition toward the world we can encourage and that would be fairly non-controversial.”

But Campbell pointed to the web as an exhilarating, thrilling and successful counterexample of scaling that brings greater personal involvement and engagement. For some reason, though, the scaling strategies of the internet — innovations from the edges, decentralization, common protocols, a certain kind of personally motivated activity that can nevertheless be shaped for good or ill by various kinds of community — seems to have been of little interest to higher education, he noted. “Instead we have sold our birthright for a mess of pottage.”

“One of the things that really does keeps me up at night is the tragic irony that we cannot see our own highest principles in the digital world at its best,” Campbell said. “We helped be the model for that world. I am aware that there are many problems with the web — security, for instance. I am aware that there are nasty places in Reddit. However, without our strong and self-recognizing presence in those areas, we do our students a grave disservice, and we turn our backs on a model of scaling we could adopt, adapt and be creative within in a way that would benefit our learners. I think there are certain aspects of privilege that have gotten in the way of recognizing our own strengths, and it makes me very sad.”

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David Raths is a freelance writer based in Philadelphia.
IF YOU'RE ASSESSING and tightening your institution’s security profile, a good place to start is the CIS Critical Security Controls. The National Security Agency (NSA) created this list of 20 top security recommendations in 2008. Over time, it has been revised and updated by a consortium of U.S. and international agencies, including both government and private industry. The Center for Internet Security (CIS) currently manages the list and its contents.

The Cybersecurity Law Institute calls the CIS Critical Security Controls list “the de facto yardstick by which corporate security programs can be measured.” See the complete list for more information. Here are short descriptions of the first five items on the list:

1: Inventory all Devices
The prioritized list starts with this important security control. This is clearly the No. 1 step you can take to improve your security posture. Do a full inventory of all authorized and unauthorized devices on your networks. This step is foundational and ranks “very high” for attack mitigation. There are a handful of asset discovery and vulnerability management tools commonly used for this step. This greatly reduces the ability of attackers to find and exploit unauthorized and unprotected systems.

2: Inventory all Software
Your institution may already have software change management, whitelisting and vulnerability management tools installed. If not, this is a good time to do so. The idea is to first gather information on installed software and patches. Then make that data available to security practitioners, along with tools that can calculate any changes in the data. Software inventory tools, CIS says, should “cover each of the operating system types in use, including servers, workstations and laptops.” The software should also track the underlying version of the operating system; as well as installed applications, including software type, version number, and patch level.

3: Secure Configurations for Mobile Devices
This is a challenging security control on college campuses. The Bring Your Own Device (BYOD) movement has become the rule of the land. And most students tend to carry multiple devices at once. College campuses are inundated with new
devices at the beginning of each semester. To prevent such abuses as installing unauthorized software, the CIS recommends limiting installations and limiting administrative privileges to “a very few users who have both the knowledge necessary to administer the operating system, and a business need to modify [the underlying configuration].”

4: Continually Assess and Remediate Vulnerabilities
For institutions of higher education, this control entails regularly running automated vulnerability scanning tools against all systems, and quickly moving to fix vulnerabilities. Software that compares data from vulnerability scans to outside threat lists can help by generating an alert when it uncovers items on the threat list, such as malicious registry keys, IP addresses and domain names.

5: Control Admin Privileges
Two common types of attacks begin with enticing users to open a malicious e-mail, attachment or file or to visit a malicious web site. Then the attackers are often able to crack an administrative password to gain access to a target machine. To guard against this, CIS recommends, minimizing administrative privileges. Focus auditing on administrative privileged functions, the report further recommends, “and monitor for anomalous behavior.”

To help implement and integrate the 20 security controls on the CIS list, consider a single integrated platform for overall security that can ingest, organize and analyze the data from silos across campus. Set up the software to verify incoming data from various programs, execute additional security requirements as needed, and support the activities of your IT security team. When all the data in your organization is indexed and available, security teams can instantly compare and analyze disparate data sources, making it easier to protect your organization.

Go to the Source
The Center for Internet Security’s Critical Security Controls provides specific actions you can take to immediately reduce the risk of security attacks. These controls are highly effective because they’re built around the most common attack patterns, drawn from leading threat reports. The list is well-written, and easy to understand and implement.

For the complete list, go to: https://www.sans.org/critical-security-controls/
Find more information on the history of the controls at: http://www.sans.org/critical-security-controls/history
For more information and analysis on each control, go to: http://www.sans.org/critical-security-controls/guidelines
Leverage Machine Data for Security

Because of its open nature, campus networks and infrastructure are at a high risk for attack. Recent statistics show the potential for abuse is growing. Higher education is no longer immune to serious attacks. A security incident strains network resources, consumes large amounts of the IT staff time, and can be embarrassing and costly to your institution.

Security experts counsel that good security doesn’t happen in one place and through one tool. A secure network employs layers of protection across the system, and uses different approaches to block attackers where possible, detect intrusions quickly, and encrypt data to prevent loss if attackers do gain entry.

Given that, an essential component of your security strategy is an overall platform to help implement and organize security policies throughout the system. Your security teams need the ability to index, search and analyze data from across campus. By combining IT data with data from other departments, colleges, and “silos,” you can gain deeper insights into software and hardware distribution, events, policies and performance. You can also significantly improve your security posture.

That sort of sophisticated platform must collect data from disparate sources, including the financial system, the student information and registration systems, the LMS, campus networks and web servers, remote sensors, mobile and online learning applications, legacy applications, application servers and structured databases. Centralizing all this data into a single console will provide unparalleled insight into the entire infrastructure and help expose any potential problems.

Monitor the Machine

This includes collecting and monitoring “machine data.” This term refers to the large volumes of data generated automatically across campus via sources such as log files, web site monitoring tools, mobile devices, and embedded sensors located on campus. Because of its sheer volume, it can be a challenge to monitor machine data. However, it is immensely valuable in revealing security and compliance breeches because you can continually scan for anomalies across the entire institution.

For example, in order to break down traditional data silos within its data center, a large university in Ohio is correlating data from multiple systems. The university's network infrastructure generates huge amounts of machine data from more than 55,000 students across 14 colleges. To help reach into the many data silos within its datacenter, the institution is using software that helps analyze complex events from many software systems across its campuses. In the process, it is not only keeping university data safe, but also improving network performance.

At a medical college in upstate New York, using a software platform to index and analyze different data types has reduced the university’s incident investigation to minutes instead of hours. Proactive searches of incoming data head off any issues on a routine basis. This also reduces downtime.

The security solution has had a direct impact on the bottom line, making incident response an order of magnitude faster and more effective.

Using machine data and a software solution that can read and interpret that data, along with the metrics, reports and dashboards to present the findings, your IT department can harness that data to ensure security and compliance, detect and manage network abuse, and enhance campus services. Correlating machine data across a wide variety of sources can help detect patterns of abusive activity as they occur, instead of after the fact.
RAISE YOUR SECURITY PROFILE

Visibility and real-time insights are keys to ensuring a robust security posture.

Today's Higher Education landscape is changing. Universities and colleges remain focused on enrollment and retention, but face increased competition and tightening budgets. Many universities have essentially become small cities that aim to provide their students with a fully connected and secure experience. As each semester begins, thousands of students converge on campus carrying multiple devices ranging from laptops to tablets to mobile phones. With this reality, ensuring the security of campus networks is one of the critical challenges faced by higher education institutions.

While commercial entities can limit access to their networks and control how those networks are used, colleges and universities don’t have that luxury. Schools must adhere to the needs of their students, making it much more difficult to educate and manage users, set and enforce universal policies, and keep diverse networks secure.

Despite growing awareness on college campuses about security issues, huge challenges remain including a lack of standardization in university IT departments. Some institutions have a centralized IT department, while others have individual IT groups for each department or school. These departmental IT silos often are more difficult to manage. The constant flow of new users and unregulated devices makes securing campus networks increasingly difficult. Universities need to give students easy access to the network, create a positive user experience, and ensure their campus environment is secure.

What Campus Networks Need Today

Campuses need a comprehensive solution that provides visibility into their complex environment to maintain network security. Every user, device and activities on the network generate data. This machine data offers tremendous value, whether it is for the security group, or any other network management or operations center. Real-time analysis of this data will not only improve security, it can also give schools insights into student behavior, so they can provide better services to them moving forward.
Splunk software offers higher education a comprehensive platform that can deliver powerful insights by combining and analyzing university data from every imaginable source—registration software, financial systems, student information and learning management systems, web services, mobile apps, remote sensors and network activity. Rather than dealing with silos of information, Splunk centralizes data collection and aggregation without the overhead of traditional data stores. Providing university security and IT leaders with this “single pane-of-glass” perspective enables usage patterns, potential vulnerabilities, malicious threats, and general trends to be detected in real time so university leaders can make informed decisions.

Splunk offers the capabilities universities need to break down what’s happening across their “small city” environments to better protect and serve students. Collecting machine data and correlating it across a wide variety of sources is critical to reliable network security. Intelligent analytics can shed light on who is accessing campus networks, what and how they are accessing, as well as help institutions identify unauthorized or ‘hidden’ devices.

Imagine an institution-wide system that can ensure security and compliance throughout the campus, detect network abuse instantly, and reveal ways to enhance the institution’s IT services to better serve students. Universities can achieve this by better managing, analyzing and protecting campus systems and networks, thereby creating an enhanced environment for recruiting and retaining today’s fully connected student.

For more information and to download Splunk Enterprise for free, visit explore.splunk.com/highered
Developing the Big Picture for Classroom AV Projects

When designing classroom audiovisual systems, it’s important to clearly define the project’s overall goals, requirements and direction. Here’s how.

When a college or university department (the client) decides it would like to initiate a construction project, its first step is usually contacting the facilities planning department. A project manager from this department is typically assigned to the project, and begins guiding the client through the process. He or she will meet with the client to establish a general idea of the client’s wants, needs, goals, timeline and budget. Sometimes this information is compiled to create a program report during this phase, but I’m going to focus on the program report later in the schematic design phase.

After the inevitable red tape has cleared and the project is approved, the project manager begins assembling the design team. The project manager sends out a request for proposals that architectural firms bid on. Those architectural firms then assemble their design team subcontractors to be a part of their bid proposal; these typically comprise engineering firms that focus on electrical, mechanical (HVAC) and plumbing, as well as a team of consultants, including an independent audiovisual design consultant. Including an AV consultant on the design team at this stage is often overlooked, but ideally that individual is a part of the project from this point on.

Administrative Phase

It’s much more exciting to jump right to the schematic design phase, but I feel like it’s important to discuss the process at the very beginning of a construction project: the administrative phase. This phase can take many different forms, depending on the complexity of the project, so I’ll present a big-picture view.

THIS IS THE second article in a monthly series focusing on the design and construction process surrounding audiovisual systems in higher education classrooms. In my first article, I outlined the various stakeholders that can be involved in classroom AV installation projects. I also described the differences between design-bid-build and design-build projects. Now we’re ready to move on to the various phases of construction projects and how they relate to AV design and support. As we examine each phase, I’ll describe the major milestones and deliverables that make up each phase. (To keep up with the AV Smarts series, subscribe to CT’s 21st Century Campus newsletter.)
Before a contract is awarded to an architect, the project manager should engage the school's AV support department to evaluate the AV consultant's qualifications on each individual architect's proposal. Unfortunately, it's very rare that anyone within the institution's audiovisual support department is involved in this stage of the project. It would be great if the AV design folks were working on the project from day 1, but it usually doesn't happen until later (and sometimes way too late in the project).

After the architectural contract has been awarded, the project moves on to the schematic design phase.

**Schematic Design Phase**

Now that the design team has been assembled, the schematic design phase can begin. The purpose of this phase is to clearly define the project's goals, requirements and direction. A big-picture outline of the project needs to be developed before starting to focus on the nitty-gritty details. Needs analysis meetings with the client and end users begin to uncover the desired goals for the project. Typically, an architectural program report is written at this point, which defines the needs of the client, offers a preliminary opinion of probable cost estimate, and provides a narrative description of the spaces and infrastructure requirements, as well as basic facility plan CAD drawings and renderings. Once approved by the client, these documents act as the foundation for subsequent design and construction administration phases. Taking the time to properly execute the schematic design phase is the key to setting the stage for a successful project.

From the AV standpoint, hopefully the institution's AV support department is engaged in the schematic design phase, and hopefully an independent AV design consultant is part of the design team right at the start of the project. As many of us have experienced, unfortunately this isn't usually the case. Quite often, the client and architect get near the end of their schematic design phase, and even into their design development phase, before realizing that they've neglected the audiovisual component of the project. Speaking from a consultant's standpoint, I'm very glad to be part of the project from the architectural proposal stage, but very often I'm hired by the architect or directly by the client well after the project is up and running.

If the audiovisual system design begins after the client and architects are well into their design process, it's important for the AV design process to take a step back and start with a thorough schematic design phase. The architects and engineers may be up to their infrastructure design stage before the AV system design folks get involved in the project, but that's no excuse to rush through (or eliminate) the AV schematic design phase. The architects will be anxious to quickly integrate the AV system infrastructure requirements into their construction documents (CAD drawings and specifications) so they can put them out to bid to general contractors. As someone involved in the AV system design, you need to stress the fact that nothing gets specified until the AV schematic design phase takes its course.

The AV schematic design phase should always kick off with a review of all project documentation, followed by a complete needs analysis process. The AV design consultant reviews all documents (drawings, the architectural program report, etc.) that have already been prepared by the client or the architect/engineers. The AV consultant will then schedule meetings with the project leaders, the design team, clients and end users to discuss their AV-related needs and goals. The project's AV consultant should include the campus's AV and IT support staffs in this needs analysis process, even though those individuals may not yet have a direct interest in the AV design for the project. The AV consultant then begins...
Projects will inevitably experience changes to their scope, but without a clearly written AV program report to refer to — and a properly defined change process — you’re setting yourself up for a scope creep mess.

Typical components of the AV program report are: a project summary, list of project stakeholders, summary of the client’s AV needs, descriptions of the AV-equipped spaces, narrative descriptions of the AV system’s capabilities and equipment, and architectural/infrastructure considerations. The program report shouldn’t dive too deep into specific equipment makes, models, cables, connectors, etc. It should rather take a big-picture approach to defining the project’s AV systems. An exception to this will be if there are clearly defined equipment standards on campus that need to be incorporated into the AV design.

Attached to the program report is an opinion of probable cost (OPC) document created by the AV consultant. This is a preliminary AV system cost estimate that includes equipment/material costs as well as AV integrator labor costs. The cost for AV system-related infrastructure may also be included. These equipment and labor costs aren’t sourced from an AV integrator at this point in the project. They’re best-guess estimates determined by the AV consultant using past projects and industry experience.

This document is used for project budgeting purposes, and I’m guessing that most clients will admit they immediately flip to the OPC when they receive the program report. As the project makes its way through the schematic and design development phases, this OPC will be revised numerous times. When the project is finally up to the bidding phase, the OPC will be used as a benchmark to review and compare AV integrator proposals.

After the program report and opinion of probable cost documents are approved by the client, the AV program report should be distributed to all project stakeholders, no matter how small their involvement may be with the AV system design and installation. The project now leaves the schematic design phase and the design development phase begins, which I’ll discuss in part 3 of this series. 

Mike Tomei is an AV design and management consultant based out of Central New York, and the owner of Tomei AV Consulting.
3 Keys to Creating an IT Strategic Plan

An information technology strategic plan provides tech workers with guidance and ensures that all personnel are working in alignment with the university mission. Here are three things to keep in mind when formulating an IT strategy.

**WOE IS THE** IT shop operating without a strategic plan. Staffers may be tasked with supporting the overall university mission, but without a specific strategy they are working with little or no guidance. On these campuses unofficial strategic plans often hatch organically — or perhaps haphazardly — as tech workers do what comes naturally and makes sense to them, said Christopher Eagle, IT strategist and enterprise architect at the University of Michigan. A formal IT strategic plan helps ensure all personnel are moving in the same direction.

Formulating an IT strategic plan all starts with identifying an institution’s goals and objectives, aligning IT with that mission and providing all university personnel with the tools necessary to fulfill it. In other words, “Looking at what the institution wants to accomplish and then identifying the ways in which your technology services, operations and or solutions align with that,” said Mario Berry, associate vice chancellor for enterprise applications, Lone Star College System (TX). “You begin with the institution’s strategic plan and then you develop your plan and items specifically geared to supporting that or being in alignment with that.”

Darcy Turner, project director with the Office of the CIO at the University of Michigan, used the school’s mission as a jumping off point when she worked as a member of the IT strategy and planning team to create Michigan’s first IT strategy in 2012. The team identified, understood and clarified the mission, then determined how technology could enable it. “We see the mission of the university as separate. IT doesn’t drive the business or the mission of the university. We’re here to enable it.”

**1) The Process Is the Product**

Mark Hoit, vice chancellor and CIO at North Carolina State University, said the process of creating a strategic plan is as critical as the document the process yields. “The strategic plan is not about what you write, but about the process used to create it,” he asserted. When charged with creating a strategic plan, one must: consider the real business of education; solicit input from and collaborate with stakeholders; and secure
buy-in from those who perform the functions. Once this is accomplished, IT must convince stakeholders that it has the tools and knowledge to improve their processes. “It should not be just a bunch of IT people creating a plan. It’s the people who need to get the work done and the IT people working together figuring out how to make that enabled,” said Hoit.

Darcy agrees. When the Michigan IT strategy and planning team developed its first IT strategy, it quickly realized that the conversations it was having with the stakeholders were almost more important than the final deliverable. The act of creating the plan allowed the team to cultivate those partnerships planning in the Office of the CIO. “We have senior faculty leaders who represent the mission across the university. We have someone who represents teaching and learning across all the schools and colleges. It’s not a job, but it’s a role they fill,” said Curley. This approach helped the team understand teaching and learning’s strategic trajectory. Then it partnered with these domain stewards and discussed with them technology’s role in
enabling and supporting the department’s strategy.

To ensure all stakeholders on the NC State campus had the opportunity to voice their opinion about the contents of the university’s IT strategic plan, Hoit created a steering team, which managed the creation of the plan but did not have a hand in creating it. The team solicited input from individuals across the entire campus. The 500-plus individuals in IT, administration and those with business control all had a voice.

The team gathered information using a variety of methods like focus groups, surveys and a gallery walk. The steering team organized the information into themes and tied them to university goals. An outside consultant then linked the themes to the goals and created a table so everyone could see that they had not been ignored.

2) Engage the Crowd

In The Wisdom of Crowds, business journalist James Surrowiecki posited the idea that large groups of people are smarter than an elite few. The University of Michigan’s IT strategy and planning team applied this theory to develop its IT strategic plan. “(We had) literally hundreds of meetings, with IT folks, non-IT folks, faculty, staff, teachers and students trying to get that input,” said Eagle. Then the team created a Google Doc and invited anyone to share ideas in the document. Ultimately 200 individuals typed in what became the final document.

But conversations with stakeholders and crowdsourcing are not enough. It’s important to get the strategy down on paper so those involved can execute on the plan, said Turner. The physical document becomes a valuable artifact when the team shares it with the University of Michigan community.

To make that final document valid, it’s crucial that key players buy into the goals and strategy and know their roles. At NC State Hoit created an implementation team, narrowed his plan down to six important implementations and appointed a leader for each. “[Three of the six] were led by non-IT people. By the time you get into some of these implementations, it’s more about process change and culture than the actual technology,” said Hoit.

IT at the University of Michigan is decentralized, with more than 70 IT departments across the campus. Eagle didn’t view the release of Michigan’s plan as an implementation so much as a way to reduce the randomness that often occurs in the absence of a plan. “If you get everybody thinking the same way and we can provide some guidance, then [people will think more strategically],” said Eagle.

Today, IT strategic plans may contain nothing more than a summarization of the core values and strategies that align with organizational values.

3) Brevity Rules

Three or four years ago, IT departments typically created tactical strategic plans complete with procedures, appendices and indexes. Today, IT strategic plans may contain nothing more than a summarization of the core values and strategies that align with organizational values. At one point Berry’s strategic plan at Lone Star was about 30 pages. Now it’s two pages of the most crucial elements.

The IT strategic plan that Michigan created in 2012 was 44 pages long. When the team set out to create its latest plan, input from high-level governance groups suggested that the team present just a handful of goals. Sharpening the focus allowed the team to be bolder and the plan to be more actionable and visionary. “We wanted it to be easily communicated, easily understandable, easy to remember … five pages or less,” said Turner.

Hoit’s plan at NC State is just eight pages with a two-page summary. “Nobody’s going to read anything longer than that,” he said. CT

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From interactive video to digital textbooks, these tips and tricks will help instructors innovate with technology in the classroom.
15 SITES FOR FREE DIGITAL TEXTBOOKS

We’ve collected an up-to-date roster of resources that offer quality learning content without the high price tag of traditional texts.

By Dian Schaffhauser

“Open” has gone mainstream. The world now celebrates Open Education Week. The U.S. Department of Education announced an “Open Education” or #GoOpen initiative and ran its first “@GoOpen Exchange” to get schools and educators committed to the use of open educational resources (OER). Students at Ithaca College (NY), The College of William & Mary (VA) and Santa Barbara City College (CA) are all pushing their schools to adopt OER. Multiple colleges and universities are trying out no/low-cost OER degree programs. Amazon looks to be getting into the OER business with “Inspire.” And a bipartisan group of Congressional staffers recently held a briefing to learn from experts why they should care about OER.

The demand for free learning content may be loud and clear now, but back in 2013 when Campus Technology first surveyed the top sources for free digital textbooks, the OER world seemed a quieter, less tweeted place. What hasn’t changed, though, is that faculty and students still want to know where to go to find the goods.

The following list offers 15 sources of quality digital content to use in your courses without worrying about the price tag.

**BCcampus OpenEd**
In 2012, the province of British Columbia announced the “BC Open Textbook Project” and designated BCcampus to create a collection of open textbooks that could be used in the top 40 highest-enrollment subject areas. While many of the books and their ancillary resources have been adopted from other sites, the initiative has also produced its own OER textbooks. In many of the categories, BC faculty have reviewed the resources to give the local perspective.

**College Open Textbooks**
This collaborative effort among education, nonprofit and for-profit organizations affiliated with 200 colleges has set out to build OER awareness within two-year colleges. The site has peer-reviewed more than 100 OER textbooks and provides links for hundreds more. COT isn’t a repository, but its links to free textbooks by subject run from anthropology to statistics.

**Global Text Project**
Started when a group of educators created a Wikibook, this English and Spanish language collection includes some unique titles under-represented by other sources, such as *CIO Handbook*, *Data Mining for the Masses*, *Game Programming* and *Practical Plastic Surgery for Nonsurgeons*.

**Lumen Learning**
Overseen by influential OER activist David Wiley, Lumen’s Candela Learning catalog offers links to its own content as well as the content developed by institutions it has worked with on OER initiatives, such as Tidewater Community College (VA) and Washington State Community and Technical Colleges. The content isn’t technically downloaded as
a file; it’s made available in HTML format, which can be accessed through a school’s learning management system.

**MERLOT II**
The granddaddy of OER, managed through the California State University System, is looking mighty sprightly. The current catalog offers nearly 29,000 science and technology resources, 4,600 resources for math and statistics, 8,300 results for humanities and 9,400 for education. That doesn’t count the arts, social sciences or workforce development. It should be noted that these aren’t all textbooks. You’ll also find plenty of case studies, assessment tools, online course modules, journal articles, quizzes, simulations and tutorials. Look for the “MERLOT Classics” icon for particularly exemplary models.

The California Open Online Library for Education (COOL4Ed) is a MERLOT service to help colleges and universities in the California State University, California Community Colleges and University of California systems identify and evaluate open textbooks for general education courses.

**MIT OpenCourseWare**
While this university site is known for its open courses, it also includes an online textbook page with links to the textbook files used in the courses. It’s especially useful for finding course materials in areas where OER is sparse: civil, electrical, environmental and mechanical engineering; material and nuclear sciences; and aeronautics and astronautics, among other subjects.

**OER Commons**
The nonprofit Institute for the Study of Knowledge Management in Education, based in Monterey, CA, launched the OER Commons in 2007 to share content “from around the world.” The 64,000-item collection covers curricula from preschool through adult education. Users can filter based on education level, subject, material type, conditions of use, content source and other criteria. Within the college level, resources tagged as “textbook” top out at just under 600 results, many culled from the other collections referenced here.

**Open Culture**
Started by an associate dean at Stanford’s (CA) continuing studies program, this site brings together a curated “meta collection” of free textbooks taken from many of the other sites included in this article as well as other pockets of the web where a faculty member has put digital textbooks together for his or her courses and made them openly available. Open Culture also provides collections of free online courses, movies, audio books and other forms of education content.

**Open SUNY Textbooks**
The latest publication in this pilot effort by the State University of New York libraries is Writing in College: From Competence to Excellence, which joins 14 other titles written by faculty and published by the libraries.

**Open Textbook Library**
A consortium of higher ed institutions and systems has networked to support the use of OER within their programs. Supported by the University of Minnesota Center for Open Education within the College of Education and Human Development, the library of textbooks pulls titles from multiple sources, including many others in this list.

**OpenStax College**
When we first looked at this organization, which launched from Rice University (TX), it had 13 titles. That has grown to 22, covering topics from anatomy to sociology. Its stated goal: to provide free textbooks to 10 million students. In addition, its parent organization OpenStax CNX is an open library of learning objects that are both organized into books and available as “pages” for compiling and mixing into custom curricula.

**Project Gutenberg**
This effort to digitize cultural works has been plugging away at its mission since 1971, when it undertook the creation of
students and instructors to develop content such as labs, homework and worksheets, which is then shared with everybody in an open manner as a textbook replacement or “wiki-text.” Specific instructors may maintain their own mashups of the wiki content for use in their courses with links through the site. Currently, wikis cover chemistry, biology, geology, statistics, physics, math and solar. The work is directed by chemistry prof Delmar Larsen.

Wikibooks
Promising “open books for an open world,” this site, which is hosted by the Wikimedia Foundation, offers 2,900 textbooks, categorized by subject, completion status and reading level. Many of the books are available for download as PDF files.

UC Davis ChemWiki
This collaborative project focused on STEM topics invites faculty and instructors to develop content such as labs, homework and worksheets, which is then shared with everybody in an open manner as a textbook replacement or “wiki-text.” Specific instructors may maintain their own mashups of the wiki content for use in their courses with links through the site. Currently, wikis cover chemistry, biology, geology, statistics, physics, math and solar. The work is directed by chemistry prof Delmar Larsen.

Small Presses

Some sites provide textbooks by the handful, some on a single subject and others just single titles. We'd be remiss not to mention at least some of the smaller players:

Bay College Library (MI) currently has three faculty-written OER textbooks: one on career exploration and two on U.S. history.

Green Tea Press is a collection of free textbooks on programming by Allen Downey. This professor of computer science at Olin College of Engineering in Massachusetts proclaims in a manifesto on his site, “Students: You should go on strike. If your textbook costs more than $50, don’t buy it. If it has more than 500 pages, don’t read it. There’s just no excuse for bad books.”

The first edition of Introductory Financial Accounting by accounting professor Anthony Cataldo II at West Chester University (PA) was written while Cataldo took a sabbatical. Now he’s publicly asking for help in correcting typos and making improvements.

Noba focuses solely on psychology topics. The brainchild of two educators, Ed and Carol Diener, who founded a nonprofit expressly for the purpose of building Noba, offers “ready-made textbooks” as well as 93 learning modules that can be pulled together for a specific educational use.

Scottsdale Community College Math Department (AZ) faculty have written four math textbooks and final exam reviews and made them available for download.
Developing custom ones. We asked three game-savvy educators and technologists for their advice on introducing gamification to the college or university classroom.

1) Begin by Defining Goals and Objectives
As with any endeavor, the first step should always be to figure out exactly what you want to achieve by gamifying a course. Is the objective to boost student engagement, improve knowledge retention, promote communication and collaboration, or something else?

Edwin Lindsay is a teaching assistant professor of sport management at North Carolina State University who has gamified his Introduction to Sport Management course. While his project was a massive two-year undertaking that involved developing a plug-in for Moodle to create a personalized game experience within the LMS, he recommends figuring out the end goal before beginning a gamification project of any size because it can help determine the path forward.

“If my goals and objectives are simply to review for my midterm or my exam, then there are some external features out there, tools that you can utilize to put your content in, that will allow students to basically review for anything,” he said.

2) Start Small and Develop Iteratively
Scott Reinke is the coordinator for the BSU Achievements Program at Ball State University (IN). He was involved in the development of Ball State Achievements, a mobile app designed to improve student retention by gamifying positive activity outside the classroom (and winner of a 2015 Campus Technology Innovators award). He advocates a “fail fast” mentality when gamifying a course.

“Use an iterative process and don’t necessarily try to build everything all at once,” he said. “See if it works — and if it doesn’t then immediately throw it away. I guess that’s kind of the essence of a fail fast mentality. Just try it, even if it’s just an assignment in your larger class.”

3) Network With Other Educators Using Games
Communication and collaboration are key components of 21st-century education, and they’re applicable to professional development, too. Educators interested in gamification are not alone, and they can benefit from sharing knowledge and ideas with each other.

Reinke participates in just such a group at Ball State. “I meet with a group called the Serious Games Knowledge Group. There are eight or 12 of us, and we have lunch once a month and talk. They’re all just people who take gaming and gamification seriously in education,” he said.

4) Use Simple Game-Creation Tools
Drag-and-drop game development tools such as GameSalad and GameMaker: Studio make it possible for non-
programmers to create simple, visually appealing digital games. “There still may be a learning curve involved, but a lot of those are WYSIWYG [what you see is what you get] platforms that let you click around and figure stuff out through logic rather than coding,” said Reinke.

An even simpler way to create digital games is to use a tool such as Microsoft PowerPoint to create digital versions of board games. “It allows for moveable pieces on a background image that is essentially your board,” said Joseph Bisz, an associate professor of English at Borough of Manhattan Community College in New York and an educational game designer. He has created Concentration-type memory matching games using PowerPoint. The instructor can project the game on the screen for the whole class to participate or allow students to play in small groups around a computer.

5) Get Students to Develop Games
Rather than creating a game for students, some instructors are getting their students to design their own games as a way of deepening or demonstrating their understanding of course concepts. One of Reinke’s colleagues at Ball State used GameSalad in his landscape architecture class. Students created games related to developing urban landscapes, gamifying placement of elements such as trees and roads. “Having them design games forces them into a role to really think more deeply about whatever subject it is because they become more invested in the game and their users,” said Reinke.

6) Take Advantage of Existing Games
While K-12 may have a broader selection of digital games available on the market, higher education can take advantage of a number of existing boutique games and digital simulations. One example of a well established boutique game is Darfur is Dying, an online game that challenges students to keep a refugee camp functioning while they learn about genocide in the Darfur region of Sudan. “It helps people understand and get a better feel for what’s going on,” said Bryan Fendley, director of instructional technology and web services at the University of Arkansas at Monticello. “I think that’s one of those games that helps teach the social aspect of current events.

Penn State’s Educational Gaming Commons also offers a few boutique games, as well as general information about gamification in higher education. Technical trades and subjects with practical applications such as chemistry and biology present opportunities to incorporate digital simulations, which Fendley describes as “probably the stickiest piece that has come out of gamification for higher ed.”

7) Use K-12 Games for Remedial Education Courses
Instructors teaching remedial or introductory level academic courses can take advantage of the wider selection of existing games developed for middle or high school students.

Bisz began using games with his remedial level classes in an effort to increase student engagement. “The BBC in Great Britain designed specific digital games to teach English and math, and although they weren’t targeting higher education, our remedial students generally are about 7th grade level, and so we found these things very useful for getting the students to suddenly become engaged,” said Bisz.

8) Make It Fun
Both Lindsay and Fendley emphasized the importance of making digital games fun for the students. “It can be well
conceived from a faculty member’s perspective, but if it’s not fun it’ll fall flat on its face,” said Lindsay.

Throughout the game development process for his Introduction to Sport Management course, Lindsay invited people outside of the project to try the game and give him their honest opinions, either through forum posts or anonymous reports, and whenever possible he applied those recommendations to later versions of the game. “If somebody doesn’t want to play a game, they don’t enjoy it and then the whole reason for gamification falls apart because it doesn’t by definition really become a game at that point,” said Fendley.

9) Don’t Forget About the Pedagogy
While fun is a key element of gamification, Lindsay reminds instructors not to forget about the pedagogy in the process. “When we think about our teaching, we think about the theories that are involved in our teaching, and gaming sets itself up really well to be connected to those theories,” he said. “I found myself thinking, what would I do in a real class? What would be my mindset and how would that translate to the gaming world? And I was able to match those up pretty closely.”

10) Collect Data
Ideally, instructors should have the ability to collect data about students’ progress and achievement in the games they’re playing for a course. “Look for games that can transfer data back to a spreadsheet or a learning management system,” said Fendley.

The SCORM standard or Tin Can API (application programming interface) both provide ways to collect data from games. SCORM is a standard for communication between e-learning software products, and the Tin Can API enables software to collect and share data about digital experiences.

11) Consider Accessibility
Digital games may not be accessible to individuals with disabilities, particularly those who are visually impaired — and simply providing those students with alternate assignments or activities may not be a solution. “If we truly believe that gamification is that much better, then the alternate assignment is going to be an inferior way of learning. We’re offering somebody with a disability a lesser version of the lesson” said Fendley.

Fortunately, resources exist to help developers address the issue of accessibility in digital games. AbleGamers has developed “a 50-page living document to assist developers in the process called Includification,” according to information on the site. And Twine is a free, open source game development tool that lets anybody create simple, accessible interactive storytelling games.

12) Play Games
Educators who want to use gamification successfully in the classroom need to play games themselves, according to Reinke. Just as a person has to be a reader before he or she can become a good writer, a person has to be a gamer before being able to develop or implement gamification effectively.

“Just find games that interest you or ask people about it,” said Reinke. “That’s the best part of the group that I’m in at Ball State: Most of what we do is just tell each other about new and exciting games that we’ve found and that really helps us figure out what we want to do with our games.”
10 TOOLS FOR MORE INTERACTIVE VIDEOS

Forget about PowerPoints with voice-over — that's old school. These “new school” apps can help you engage your students while they’re learning from your lectures.

By Dian Schaffhauser

If all your recorded lectures are no more than PowerPoints with audio, a flipped classroom is no more thrilling or engaging for students than just attending class in person. So why not add some interactivity to your videos and have some fun? According to Phylise Banner, director of online teaching and learning at Clarkson University (NY), your students will thank you.

Banner and her colleague Frank Tomsic, director of the McCormick Educational Technology Center at Rush University Medical Center (IL), are the original masterminds behind the “Technology Test Kitchen,” a phenomenon introduced at an Online Learning Consortium (OLC) event that has since cropped up at multiple conferences where faculty, instructional technologists and instructional designers congregate. The idea: to provide an interactive space “where people can come and play with the [technologies] we’re talking about.” Every event features a different roster of experts sharing their favorite tools and showing others how to use them.

Last year, OLC “master chefs” published an ever-changing Creative Commons-licensed “recipe book” with brief descriptions of almost three dozen tools and applications for use in the lecture hall to “foster creativity in learning.”

Banner shared seven of her favorite tools with Campus Technology, specifically for making video content more interactive — and the Test Kitchen recipe book offers three more.

Zaption for Active Media

It used to be that students watched videos and then headed to the learning management system to enter their comments in a discussion forum. Now, they can do both in one place. “Video does not have to be static anymore,” said Banner.

For example, Zaption lets an instructor add text, questions and images to existing online videos, allowing students to reflect on what they’re watching. Students can also add comments, thereby “building more content around a video.”

Those extras allow the teacher to act as a bridge between what’s being shown in the video and what he or she is hoping the student takes away from the viewing experience. Likewise, the instructor can give an assignment to students to make a video and create a lesson around it as an assessment format.

On top of that, Banner added, the online program “has good analytics” that are “easy to use and valid.” The instructor can see not only the students’ answers to questions,
but also how many rewinds or fast-forwards there are and to which spots in the video. Viewer data like that can help the instructor know what parts of the video are boring, too complex or really get the conversation going.

“If we’re using any video content, we think that that’s it. It’s done. That’s content consumption. But it isn’t,” Banner insisted. “Now we have content creation in the video space. That’s what makes Zaption so great and so much fun.”

The basic version is free; an $89 annual subscription “pro” version allows the instructor to add multiple video clips to a unit, include more interactive elements such as discussions and integrate Zaption within the learning management system.

Another option that Banner has used is Vialogues, an early entrant into the education space, which allows instructors to open up their videos for student commentary. The “vialogue” may be shared in a group or made private. Viocthread, a twist on Vialogues, allows users to upload and share any kind of files — documents, presentations, images, audio files and videos — and then let others comment through the appropriate medium — text, audio or webcam.

**Echo360 to Capture Moments**

Banner likes how Echo360 allows the instructor to integrate video into courses through an institution’s learning management system. Originally gaining traction as a lecture capture application, the software has expanded “to allow you to create a whole channel right within your course,” she noted.

“You can have a video and a forum with discussion questions right there.” The teacher can pick specific spots within the video to open the discussion.

The idea of the channel is to simplify student access to the videos. Like any playlist feature, she explained, it allows for a “consolidated space — whether closed or open.”

In the vein of simplifying access to video content, Banner emphasized the importance of providing not just video files in MP4 format, but also audio files in MP3 format. “We can’t forget about that,” she said. “I think that anytime we’re feeding our students video, [we need to] give them audio too.” That will enable them to listen to lectures while they’re doing other activities, such as exercising or commuting.

**Veescope to Situate You Somewhere Else**

Veescope Live is a simple “green screen” app for iOS devices that allows the user to record video with switched backgrounds using any photo or movie on the device. (Green screen technology is what’s used to place your local weather person in front of a dynamic map of your region while showing the forecast.) Combined with a green screen, blue screen or even plain white wall, the program “enables you to key out the background,” explained Banner.

“Let’s say you’re teaching disaster management and you want to put yourself at FEMA headquarters,” she suggested. “You get a photo of FEMA headquarters. You put it on your iPad. You take your video. You key out the wall behind. Then you’re standing there in FEMA’s headquarters. I love Veescope.”

**Adobe Voice to Explain Concepts With Pizazz**

This free app for the iPhone and iPad helps the user create animated videos with no actual filming. You create your video by picking images from an extensive, searchable set or your own collection, add your presentation slides, then record your voice and let the app take it from there. Adobe Voice cleans up the quality of the audio and even adds background music. The program is integrated with the Noun Project, a fee-based library of icon images, which can be individually dragged into the presentation.

Banner finds Adobe Voice useful for simple development of video. “Let’s say you want to talk about what to do when
been photographed in panoramic form and made available on Round.me, an online service where photographers share their images.

“Everything is carved out of salt. So you can show pictures of it, but [with pictures] you can’t really feel what it’s like to walk down the stairs and turn around and look up and see a chandelier or look around,” said Banner. Using Google Cardboard, “when you’re talking about spaces like that, you can have that immersive experience. You can even walk through that space. It’s crazy!”

Google Cardboard to Immerse Your Students

Banner said she always shows up to the OLC Test Kitchen with Google Cardboard, inexpensive virtual reality glasses that work with smartphones to provide immersive 3D environments.

Although these technically don’t fall into the category of videos, they do provide a new way for students to experience visual content. At a recent event, for example, Banner shared images from Poland’s historic salt mines. These have a tornado is coming. You can press the icon button, search for ‘tornado’ and get these great images to bring in, simplifying visualization of your information as an instructor and creating a stunning visual,” she explained. The app records your audio with the push of a button. If the audio for a given image goes past a certain amount of time, say 30 or 40 seconds, the app reminds you to keep it short. “You don’t want to be rambling on,” Banner added.

Adobe Voice

Like to walk around while you’re lecturing? Get yourself a Swivl robot, set it up on a desk or a tripod and place your recording device loaded with the Swivl Capture app into the robot’s base. Attach an infrared marker to yourself and get moving. The robot will track your movements to keep the recording focused on you.

If you’re traveling farther afield than Swivl can keep track of, consider Periscope, an app that allows you to stream live experiences to your students. A private setting allows you to broadcast only to specific people, or you can share your broadcasts via Twitter through a tweet that directs your followers to a specified link.

Ever seen an video showing a hand drawing an animation and writing out text on a whiteboard background? VideoScribe from Sparkol is one of the tools that can do the same for your presentations. This subscription service is $29 per month or $200 per year, though education licensing is available.

3 MORE TOOLS FROM THE TECHNOLOGY TEST KITCHEN

The Online Learning Consortium’s “Technology Test Kitchen Recipe Book” includes brief how-to articles for using dozens of classroom tools. Here are three worth noting for lecture recordings:

- Like to walk around while you’re lecturing? Get yourself a Swivl robot, set it up on a desk or a tripod and place your recording device loaded with the Swivl Capture app into the robot’s base. Attach an infrared marker to yourself and get moving. The robot will track your movements to keep the recording focused on you.
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4 WAYS TO USE SOCIAL MEDIA FOR LEARNING

These four uses for social media in STEM courses focus on deepening student learning through better communication.

By Dian Schaffhauser

Much of the social media usage in college and university courses emphasizes collaborative activities, such as sharing ideas and building community — the social half of the term. But sites like Wikipedia, Twitter and YouTube are useful platforms for the media side too, enhancing communication and content delivery. Here, we look at how educators in science, technology, engineering and math (STEM) are tapping into both aspects of social media for learning. Of course, many of their methods can benefit students in any subject.

Science: Wikipedia for Graphic Communication

When Bruce Sharky, a professor at Louisiana State University’s School of Landscape Architecture, incorporated Wikipedia into a graduate class, he sparked a track of coursework that is still fondly remembered by his former students. It started when Sharky happened to attend a meeting where representatives of Wikipedia were attempting to persuade faculty to get their students involved in improving the content quality on the site as part of a new grant program. His idea was to have students develop and add new graphic images.

The regional planning class he had in mind for the project was studying the coast of Louisiana. So Sharky developed a list of “about 15 or 16 subjects, such as global warming, ground subsidence, saltwater intrusion [and] reduction of biodiversity,” he recalled. The students could pick whatever topic they wanted, find articles related to it in Wikipedia and then develop a graphic that would explain the concepts or content in that particular article.

“The students liked doing it,” said Sharky. “And they were quite blown away by the fact that they would put their graphic up for people to see and then they got comments from around the world: ‘You could improve this by doing this.’ ‘This is wrong.’ ‘Change that.’ They got feedback that they found phenomenal.”

Along the way, the exercise also “improved the graphic communication of my students related to landscape architecture,” he said.

He repeated the exercise the following year, but the students didn’t seem nearly as excited. So a year later he partnered with a biology professor to bring two undergraduate classes together for collaborative work. In teams of two, the biology students would contribute to the text of Wikipedia articles while Sharky’s students would create graphics for those same articles.

“That didn’t work out very well,” Sharky acknowledged. Students were challenged to meet because the schedules of the two classes were so different. “We tried it twice and we were just not happy.”

While that spelled the end of the Wikipedia experiment, Sharky is considering bringing it back into his classes in the original format. The exercise forced his students to “learn how to read Wikipedia,” he pointed out. “Particularly in the sciences, you realize just how rich those articles are, beyond just the words that you read. There are backups, references and things that can really help you explore the depth of the topic that you’re looking at.”

Technology: Social Programming for Persistence

A project underway since 2007 to improve retention in computer science programs recently took a new twist. Chris Hundhausen, a professor in the Washington State University School of Electrical Engineering and Computer Science, received National Science Foundation funding to...
develop a social media platform for students in introductory computer science classes. The original thinking with the Online Studio-Based Learning Environment (OSBLE) was to create a way for students to participate in a community with shared programming activities; students would tackle their assignments within a special online environment occupied by other students as well as instructors and industry professionals. People could evaluate each other’s coding efforts, answer questions and encourage persistence.

Now, the project is releasing Online Studio-Based Integrated Development Environment (OBSIDE), a plug-in that provides similar functionality, but without the weight of the whole learning platform behind it. The extension works specifically with Microsoft Visual Studio to provide “social programming” features. “That plug-in brings into the programming environment a Facebook-style activity feed,” explained Hundhausen. However, the overall goal is the same: “to make programming less isolating and more social using the same kinds of technologies students are using to socialize online.” So far, he noted, OBSIDE has been used by 1,000 to 2,000 students at Washington State over the last four semesters.

Normally, a student would have to go into another system — a discussion forum, Facebook or something else — to ask questions online. “Our environment makes it really easy for students to ask those kinds of questions in the very context in which they arise,” Hundhausen said. “We’re erasing the barriers. It’s making a huge difference. We have data to show that the participation in these conversations increases tremendously because of that integration with the programming environment.” Students are asking a lot more questions, he said.

Hundhausen and doctoral student Adam Carter have found “a strong correlation between social behavior and course performance”: Students who are more active socially do better in the course. The research project has collected evidence to show that the very act of students asking questions and reading the answers helps them “make quicker progress toward the solution.”

OBSIDE is being released as an open source project. Already a university in Germany has undertaken the work of making a version of the plug-in available for Eclipse, an open source programming environment that may have more traction in higher ed introductory computer science courses than Visual Studio, Hundhausen suggested.

“Traditionally computer science has been seen as a discipline where students work in a very isolated manner, individually on problems. What we’re trying to do is build this learning support community,” said Hundhausen. “According to social scientists, the persistence factor happens through the friends that you have, that you’re part of a community, that you’re not in it alone. What is going to keep people in the discipline is that sense of community that could be built through this kind of technology.”

**Engineering: YouTube for Assessments**

A lot of engineering coursework tends to be done on pen and paper, including the tests, according to Jeffrey Erochko, assistant professor in Carleton University’s Department of Civil and Environmental Engineering (Canada). Oftentimes, during office hours, Erochko would hear from students that they’d done poorly on exams because they “blanked out or got stressed or didn’t have enough time to finish it or forgot something.” Yet, they could face him in his office and “at least explain the concept.” He could see that they had some
level of understanding about what was going on, “but they weren’t able to demonstrate that at all on the test.”

Because Erochko’s classes tend to be on the large side — 150 or 180 students — it isn’t possible for him “to sit down with every student and get an idea that they understand the content or not,” he said. So he decided to try to replicate that experience online, asking students to create a minute-long video and post it to YouTube to demonstrate their understanding. “The idea was that it’s a stand-in for oral assessment,” he explained.

As he noted in a paper delivered at the 2015 Canadian Engineering Education Association Conference, “The short timeframe of the videos requires students to think critically about the concept and to explain it concisely.” There was also the advantage that Erochko’s teaching assistants could grade the videos “quickly, even in a large class,” he pointed out.

During the semester, the video assessment is required twice. Students are given the choice of “opting out” of the activity; but they have to replace it with an in-person presentation given directly to Erochko in his office. In the three years that he has been running the alternate assessment, only one student has chosen to opt out for “philosophical” reasons.

Erochko chooses to use YouTube because “it’s very convenient.” Students aren’t evaluated on the quality of the video; they can simply use a smartphone to capture the recording. And they don’t even have to memorize what they’re going to say — they can simply read it. Nor are the videos expected to be made public. “I encourage the students to make their videos unlisted so that they will feel more comfortable creating their video without feeling that a lot of people will potentially watch it,” he said.

This isn’t the only use for YouTube that the Canadian professor has found. He has also set up his own channel, “The Civil Professor,” where he posts examples for his students. “I basically go through sample questions related to the material, because I don’t have as much time in class to cover as many examples as I’d like to.”

Math: Twitter and Storify for Class Q&A

When students in James Anderson’s courses have questions, they can raise their hands or take to Twitter. Anderson, a mathematics professor at the University of Southampton (England), began offering the Twitter option when he realized that some students weren’t comfortable asking questions in a large group. Later, he added Storify to the mix as a way to maintain a record of those digital communications and included questions that were e-mailed to him as well.

“I realized that Twitter is not a permanent medium and that tweets disappear over the space of days or weeks,” he explained. “Using the class Storify to answer e-mails from students was a natural extension of using Storify as a place to capture tweets, and to allow me to expand on responses to the tweets where appropriate. After all, a question that one student e-mails to me is a question that I’m sure other students have — and even if they don’t, they should still be able to see the answer. The volume of e-mailed questions tends to pick up as we get close to exam time, and then I think it’s very important to allow everyone to share in the answers.”

At the beginning of class, Anderson logs into Twitter and
then during his lectures he attempts to respond to Twitter questions as soon as they come through. He said he was initially "concerned that the volume might get too large to be able to respond in real time, but in practice this has never been an issue." Sometimes, he added, he’ll provide a short oral answer and then an expanded response in Storify.

“Like many others, I struggle to get real-time interaction with the students through the lecture, and I feel that being able to answer questions on the spot, whether oral questions or via Twitter, allows for the correction of misconceptions right away.”

Anderson tends to see more Twitter action in his large first-year courses with 200 students, but more hand-raising in a final-year course with some 45 students. “My theory is that the final-year students are more confident in asking questions in class than the first-year students,” he said. “The whole point was to provide an additional route for students to ask questions during lecture, and not to replace the oral questions.”

While he’s never done a formal evaluation of the use of Twitter and Storify, Anderson is confident he’s on the right track. “The overall impact is best seen through the number of views and the number of questions asked, either by e-mail or by Twitter,” he noted. But he calls it very much a work in progress. “I’m sure, for instance, there are ways of using Twitter differently and more actively, to engage with the students. And Storify — as good a place as it is for capturing tweets and e-mails and disseminating answers and additional commentary to all of the students in the class — is not an interactive discussion forum. But it’s good for what I’m using it for.”

Leila Meyer is a technology writer based in British Columbia.

Dian Schaffhauser is a senior contributing editor for Campus Technology.
IN ORDER TO close the growing achievement gap, higher education institutions need to focus on innovation, scale and diffusion, according to Bridget Burns, executive director for the University Innovation Alliance, a coalition of 11 public research universities committed to improving graduation rates and sharing best practices. And most important, institutions need to communicate about what works and what doesn’t. “Otherwise we are sentencing other universities to repeat our mistakes and our failures — and students deserve better,” she exhorted.

Burns spoke this past March at SXSWedu as part of a panel of eight higher ed leaders grappling with the challenges of student success. In the vein of sharing ideas, each panelist weighed in on the need for innovation, speaking for seven minutes or less — about the same amount of time, Burns noted, that a busy university administrator can spare in a typical workday. Here are their insights.
1) Learning is becoming measurable — and more flexible.

“We are right on the cusp of being able to measure student learning for the first time,” said Ted Mitchell, under secretary of education for the U.S. Department of Education. “And this isn’t just about new tests — this is about new environments for learning” that help teachers and mentors better understand what makes students successful.

Mitchell gave the example of flight simulators, which not only provide students with a way to engage in the activity that they want to learn, but also have data systems that monitor students’ learning over time, providing them with structured feedback at just the right moment. This sort of data-centric assessment of learning is happening in more and more disciplines — and that opens the door to more innovation, he argued.

“As we approach the measurement of student learning through competencies and masteries, it unlocks a lot of innovative practice,” Mitchell noted. “Once one has identified the skills that students need to master, and accomplished the task of being able to measure those, you can make the learning exercise itself far more flexible.” For instance, competency-based education now makes it possible to learn from anywhere, any time — which is particularly important for today’s non-traditional students balancing education, work and family, he said.

“If you can measure student learning and mastery of competencies, if that can happen independent of time and space, then let’s certify that learning in chunks that are small,” Mitchell continued. “Let’s look at micro-credentialing as a way of building up skills for students of all ages — of building them up in such a way that they get credit for the work that they’ve done, what they’ve mastered, while at the same time they’re building a stack of certificates and micro-credentials that then would enable them to move into the labor market, to move on to further higher education.” That innovation, he said, is what will change students’ lives — and our nation — forever.

2) We need a common definition of college affordability.

“Politicians, policymakers, higher education administrators — everybody wants to make college more affordable. But what does that really mean? How do we gauge whether or not college is affordable?” — Zakiya Smith, Lumina Foundation

“Politicians, policymakers, higher education administrators — everyone wants to make college more affordable. But what does that really mean? How do we gauge whether or not college is affordable?” — Zakiya Smith, strategy director for the Lumina Foundation. There are a lot of different ways to measure the cost of college — sticker price, net price, return on investment, student loan debt — but none of those things really mean anything if we can’t come to a common understanding of what college affordability means, she said.

The Lumina Foundation has worked to develop a standard language around affordability, drawing from fields such as housing, retirement and healthcare — other social sectors that have struggled with the question of affordability. “There are things that we can learn from other sectors about how they’ve tackled their challenges of affordability,” Smith said.

“One of the main things that we learned from all these different sectors is that it’s really difficult to do this work if you don’t have a standard that you’re working from.” In housing, for example, the rule of thumb for planning and policymaking purposes is that about 30 percent of a person’s income should go toward housing expenses, she explained. Higher education needs a similar benchmark.

To address that gap, the foundation introduced the “Rule of 10”: Students should be able to pay for higher education with savings generated from 10 percent of their discretion-
ary income, over 10 years, and working no more than 10 hours a week while attending college. In this model, college affordability is defined based on a student’s individual circumstances, acknowledging that the cost of college should be an investment over time.

“This is still under development,” said Smith. “We’re hoping to get more feedback on this over the next year or so, and we really want to engage in a conversation with the community about whether it seems like this makes sense.”

3) The waves of change in higher education are far from over.

“If you think the great colleges and universities of the past will be the only great colleges and universities in the future, then you’ve forgotten everything you knew about evolution and you need to up your game,” asserted Michael Crow, president of Arizona State University.

“Our society is evolving much more rapidly than any institution of higher education,” Crow said, pointing out that the current production of college degrees in the U.S. is woefully behind population growth. To achieve its goals in graduation rates, higher education needs a new wave of innovation, he said, citing his own university’s efforts to create a new model of education where “full immersion and digital immersion are possible, costs are constrained and the scale is all scales, from individual learner to massive groups of learners, all operating at the same time.”

Crow outlined a framework for innovation wherein knowledge is emphatically at the center of every educational enterprise, “like a black hole of unbelievable intense energy.” Built around that, he said, are immersive, technology-enhanced learning (both on-campus and online), massive-scale learning, and the concept of education through exploration. “Now there are no more teachers, no more professors at the front of the stage — they are engaged in the creation of learning environments that allow people to learn at scales and in ways that have previously been not possible.”

Only then, he said, can institutions embark on the next wave of innovation. “Institutions must be driven by public value attainment,” said Crow. “They must be driven by the desire to see people become natural learners. They must be scalable, they must be innovative, they must be adaptive. They must have knowledge — the production of knowledge, the synthesis of knowledge, the storage of knowledge — at the core.”

4) Traditional instruction no longer works for today’s diverse learners.

“One of the great things about higher education is that we’re not only getting a greater number of learners, but also a greater diversity of learners — diversity in terms of age, sex, gender identity, sexual orientation, culture, ethnicity, work status, and on and on and on,” said Candace Thille, assistant professor at the Stanford Graduate School of Education (CA). On top of that, she said, there is diversity in terms of students’ prior knowledge and the skills that they have coming into the classroom.

According to Thille, such diversity calls for a new approach to teaching and learning. “We need innovation,” she said, adding, “I believe very strongly that innovation will come from inside not-for-profit higher education,” rather than from external sources or markets.

A promising example, said Thille, is the use of educational technology to create personalized and adaptive instruction. As students interact with adaptive technology, the system collects large amounts of data, models the data and then makes predictions about each student based on those interactions, she explained. Those predictions are then used for pedagogical decision-making — either feeding information back into the system to give the student a personalized learning path, or providing insights to faculty to help them give students individualized support.

“The challenge is that it’s all still active research,” noted Thille. And there’s a problem: Many of the predictive models are proprietary, with vendors unwilling to share the inner workings of the technology. “That is alchemy, not science,” she said. “We need the models and the data to be open, transparent, peer-reviewable and subject to academic scrutiny.”

Models are not neutral, added Thille. They reflect the val-
ues of the people who designed them as well as the behaviors of the population from whom the data were collected. When models are built on our existing norms, “we very much risk tooling the norms into the technology and then reproducing inequality,” she warned.

5) It’s time to take data seriously.
Ten years ago, Georgia State University faced serious achievement gaps, with graduation rates hovering around 30 percent. But thanks to a campuswide commitment to student success and a focus on data, said Timothy Renick, vice president for enrollment and student services, the institution has made a dramatic turnaround, raising its overall graduation rate by 22 points.

“We began to actually examine what we could do differently — based not upon hunches and traditions, but upon what the data told us the problems were for the students we enroll,” said Renick. “We made a commitment not to raise our graduation rate through getting better students, but through getting better — and that gain meant looking in the mirror and making some significant changes.”

One area where data helped identify a need for change was in the way students choose their major, said Renick. “When we looked at the data, one problem we found was that even the students who graduated from Georgia State were going through two-and-a-half majors before they graduated,” he explained. “Low-income students can’t afford to go through two-and-a-half majors before reaching the finish line. They rack up wasted credit hours, they add time to their degree.” With 90 majors available to them and no context to help in the selection process, students struggled to find the right fit.

The university has now introduced “meta majors”: broad categories like STEM, business or education that allow students to explore a field before committing to something more specific. During their freshman year, students take classes around those topic areas, attend lecture series, meet with faculty and go through diagnostics to help narrow down their interests. “By the time they pick their first major, it’s going to be the thing that sticks,” said Renick, adding, “In a two-year period, we’ve lowered the number of major changes at Georgia State by 30 percent.”

Paying attention to data led to a host of other changes at Georgia State, including the implementation of adaptive learning for introductory math courses, “microgrants” that help students with end-of-semester financial shortfalls, and predictive analytics for student advising.

“What is the collective impact of this approach to taking data seriously? We’re graduating 1,700 more students every year,” said Renick. “In fact, we moved our graduation ceremonies from campus to the Georgia Dome, where the Falcons play, because we ran out of room.”

6) A 21st-century learning culture starts with digital content.
In 2010, Jackson State University (MS) was looking for ways that technology could better address the needs of today’s learner. “We put together what we call our cyberlearning ecosystem,” said Robert Blaine, dean of undergraduate studies and cyberlearning. “What that means is that we’re building a 21st-century learning culture for all of our students, writ large across campus.”

At the core of that ecosystem is digital content, delivered via university-supplied iPads. “We produced digital textbooks for students and we were able to do some amazing things right off the bat,” said Blaine. “First of all, we lowered the cost for students by over 90 percent. The traditional textbooks that they were using would cost between $100 and $300 a book. These books cost $9.99.”

The benefits of digital textbooks go beyond cost savings,
noted Blaine. Jackson State is able to align its learning content with the specific outcomes that the institution wants to achieve. “We’re able to coordinate the curriculum and focus on the skills that students need,” he said. “And we’re able to bring new relevance to the curriculum by bringing voices into the conversation that have been historically left out.”

7) We need to change the way students think.
Developing the skills to think and work through problems is every bit as important as mastery of the material in a particular subject, according to James Pennebaker, a professor in the Department of Psychology at the University of Texas at Austin. When students learn to change their fundamental thinking, he said, they carry those skills over to other subjects. “If individuals take a class and do well, they should do better in their next courses. If they take my class, I hope they do better in future classes, and I don’t care if they have anything to do with psychology,” he asserted.

That is the philosophy behind Project 2021, a UT-Austin initiative focused on reinventing undergraduate education. The project aims to “change the nature of teaching, the nature of how we do curriculum, and rethink how we think of a course calendar,” said Pennebaker. A key part of the revamp is finding ways to measure what works.

“We’re building a research infrastructure that will go through and analyze not just how [students] do in their classes and future classes,” said Pennebaker, “but also, how do they change in terms of their connection with others? Do they become more connected with the university?”

The university is also working to engage students with a sense of community. “As we develop various classes, including online classes, one of our biggest fears is that students become more disengaged, less connected with others,” Pennebaker explained. “One of the best predictors of dropping out of college is the failure to feel a sense of belonging.”

Established in 2015, the Mixed Reality Lab at Oklahoma State University provides a range of AR, VR and 3D printing tools so that students and faculty researchers in design disciplines can work in virtual, physical and augmented reality environments. By Mary Grush

C-Level View

Mixing It Up in the Design Lab

The Mixed Reality Lab at Oklahoma State University focuses on research and instruction in augmented reality, virtual reality and digital prototyping for design. It provides space and infrastructure for both students and faculty researchers to work on design-related projects that incorporate AR, VR and 3D printing tools. The lab helps students, researchers and, through outreach activities, the broader community learn how to apply these technologies in design.

CT asked Tilanka Chandrasekera, an assistant professor in the Department of Design, Housing and Merchandising at OSU, about the Mixed Reality Lab’s goals for research and instruction.

CT: How did the Mixed Reality Lab at OSU come about?

Chandrasekera: The Mixed Reality Lab is an initiative of the Department of Design, Housing and Merchandising in the College of Human Sciences at OSU that allows students, faculty and researchers to work with AR, VR and 3D printers. Students can explore and experience the use of these tools in the design process; faculty can exam-
The impact the tools have on teaching and learning; and the broader community can benefit from the output of our researchers.

But perhaps the key reason for establishing a lab was for students to learn how to communicate their designs. We recognize, of course, that designers express things visually, and they try to communicate their design ideas through visual media. Fifty years ago, a hand sketch might have worked. But today, we have different digital tools to help us communicate our designs more effectively. Tools and practices are evolving around us, of course, but the lab will help prepare our design students in this important aspect of their profession.

CT: What, in general, are the types of technologies in the lab today?

Chandrasekera: Primarily, as I mentioned, we have AR, VR and 3D printing tools. Augmented reality is a relatively new technology for designers that allows them to experiment with virtual design elements by overlaying them onto real, physical environments or representations of the real world. Using the lab’s VR displays, students can try out their designs in a fully immersive environment. 3D printers are used by interior design students for prototyping furniture and other design elements, while apparel design students prototype garments and fashion accessories.

The lab not only provides a growing array of technologies that prepare design students for their profession; ultimately it will also help researchers understand and communicate new, seamless workflows for this important constellation of tools — AR, VR and 3D printing — as these technologies become more mainstream in the design world.

CT: What’s the difference between virtual reality and augmented reality?

Chandrasekera: VR puts you inside a computer-generated environment that is not connected to the “real,” physical world at the time you are experiencing it. It’s entirely virtual. AR, however, allows you to overlay virtual elements onto a physical environment — in effect, you are mixing virtual elements into your physical reality.

CT: Can you explain the term “mixed reality”? What mode do the students typically work in?

Chandrasekera: The term mixed reality comes from a paper by Milgram and Kishino, published back in 1994. The authors talk about the virtuality-reality continuum, where on one side of the continuum you have the virtual space, and at the opposite end you have the real, physical world. In the middle range, they identify augmented reality and augmented virtuality — which is what they term “mixed reality.” Today, the combination of virtual and real-world spaces may also be called mixed reality.

At the Mixed Reality Lab we try to have students work across the continuum — in the real, virtual and mixed spaces — experiencing them all.

CT: What are some of the tools in the lab that support work along the virtuality-reality continuum?

Chandrasekera: If you look at tools in the lab in the context of the virtuality-reality continuum, we have different
modes of VR provided. For example, we have the passive 3D stereoscopic projector, multiple HMDs [head-mounted displays] for VR and multiple HMDs for augmented reality. We also have both PC and mobile AR capabilities. And to address the physical component, we have, of course, the 3D printers. We have many tools in the lab — other tools for use along the continuum include body scanners, motion capture systems and more. And not to be overlooked, importantly, we have a collaborative design console that allows designers to collaborate on design projects.

CT: Do the collaborative design tools in effect place you at different points along the continuum based on the tools you and your collaborators use?

Chandrasekera: You might look at it that way. At least you would always be somewhere along that continuum.

CT: Can you talk about some of the lab’s projects?

Chandrasekera: There are several. One is the Augmented Reality Model Exchange (ARMeX), where we are trying to explore how a 3D, augmented reality model can be exchanged between two locations; in another project we are looking at how people perceive spaces with regard to color, using VR; and one of our latest projects is a virtual museum collection.

CT: Given the notion of a continuum, and all the different tools that a designer might use in different phases of a project — and in collaboration with others — are you examining workflow issues? Are students picking up on workflow as they use the Mixed Reality Lab?

Chandrasekera: An example might help to answer your question. In some of our research on mixed reality for teaching and learning, we are studying how students perceive 3D printing. As a part of that research, when our students design furniture pieces, we look at how they perceived that process, especially from the perspective of workflow: from digital modeling to prototyping of the model, with an augmented reality phase in between. And in general, in looking at workflow from a design standpoint, we often see a trial-and-error process. For example, when we are designing a house, we start from a conceptual statement, adding and changing as we consider and reconsider our ideas. We look at many “what if?” scenarios. This is called divergent thinking. We are trying to have several potential solutions to draw from in our creative process.

It’s useful here to note an important aspect of our digital design tools — if we were to try to experience all our solutions in a physical model, it would never be cost effective or practical. Even a scaled physical prototype (rather than a 1:1 physical model) might be impractical, causing us to fixate on a given iteration simply to pause the process and quit using so much expensive material. In the digital space, you can do a lot of modeling without much chance of economic or similar repercussions or a perception of waste. So our digital tools and our work toward the virtuality end of the continuum — afford us great opportunities for divergent thinking, thus supporting the creative process.

While there are no prescribed workflows, our research allows us to examine workflow in various project examples to try to discover how these workflows affect design and design education. And, along the virtuality-reality continuum, the students will find appropriate tools for different stages of their process. As they mature as designers, they will understand and appreciate how their workflow moves through the virtuality-reality continuum.

CT: The Mixed Reality Lab is still fairly new — opened in 2015. Do you have plans to expand it?

Chandrasekera: Yes, and soon. We are building a new wing to our existing Human Sciences Building, and on the top floor in that building there is going to be an additional lab at a much larger scale. We’re looking forward to more exciting work — and change — in mixed reality. CT
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