ECAR Study of Undergraduate Students and Information Technology, 2013

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Contents

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Foreword

Why do we study student technology choices and preferences? With the first student study launched in 2004 we had an instinctive sense of why the exercise was valuable. Several campuses had been collecting data on student technology use—some of them for quite a while—but this included little broad and generalizable data about how students in higher education were adapting to and using technology. There was speculation but little real data-driven insight. The first ECAR student study brought a larger perspective to what technologies students were using and to what they were thinking about and doing with respect to technology.

But at the time I am not sure that we fully understood just how valuable the product and the process that we created would become. The value has both grown and become more evident over time. The body of longitudinal data that we have built and the insight it brings us about trends reflect the rate at which technology has changed over the past decade. In 2004 there was no YouTube or easily accessible video, mobile devices had made little impact, *blended learning* was a relatively new term, the consumerization of technology had not really taken hold, and MOOCs (massive open online courses) and digital badges were yet to be encountered.

One feature common to all of these technology changes is the way they empower the individual user. This makes it imperative that we have the kind of data that the ECAR study gathers and with the large and varied sample that it is able to muster. If technology is personalized and if students are bringing their own devices and using consumer-grade tools, then we need to know what they use and to what ends. We need to think through some of the implications of this usage for faculty, administrators, and technology support staff.

While changes in technology over the decade chronicled by the ECAR student study have been profound, there is an amazing sturdiness to student attitudes and preferences about technology and in its corresponding patterns of use. From the beginning students saw promise and utility in technology (though perhaps less direct relevance to their academic success than we might like), but clearly they had some reservations about it and some clear boundaries for its use. Reviewing 10 years of the study shows how students are generally slow to adapt to new technologies and practices, especially where it relates to their academics. There is an apparent disconnect between the technology students have and use and the practical application of these technologies "in the classroom." Doing more to facilitate use of technology in creative and meaningful ways—ways that encourage and support the use of technology for academics—is something that each of us has a certain level of responsibility for to improve students' technology experiences.

Glenda Morgan, University of Illinois at Urbana-Champaign

Executive Summary

Since 2004, ECAR has partnered with higher education institutions to investigate the technologies that matter most to students by exploring technology ownership, use patterns, and perceptions of technology among undergraduate students. In 2013, the ECAR technology survey was sent to approximately 1.6 million students at 251 college/university sites, yielding 113,035 respondents across 13 countries. This year's findings are organized into four main themes to help educators and higher education institutions better understand students' current experiences:

- Students' relationship with technology is complex—they recognize its value but still need guidance when it comes to better using it for academics.
- Students prefer blended learning environments while beginning to experiment with MOOCs.
- Students are ready to use their mobile devices more for academics, and they look to institutions and instructors for opportunities and encouragement to do so.
- Students value their privacy, and using technology to connect with them has its limits.

These themes not only inform us about undergraduate students' opinions concerning technology, but they can also provide insight about the technology needs and expectations of tomorrow.

Summary of Findings

Students' relationship with technology is complex. They recognize its value but still need guidance when it comes to better using it for academics. The affinity of undergraduates for multimedia, mobile devices, and multitasking is well documented. What is less well recognized is the circumspect way in which students think about integrating technology into their academic lives, a characteristic of college students that has persisted for many years. Educational technology need not be flashy in order for them to value it (e.g., the course management system [CMS], asynchronous discussions, and online course content), and even the most dedicated technophiles want to know how the latest innovation will help them in their classes and in their undergraduate experience generally.

- Students value the ways in which technology helps them achieve their academic goals and prepares them for their future academic and workplace activities.
- Students are generally confident in their preparedness to use technology for coursework, but those who are interested in more technical training favor "in class" guidance over separate training options.
- Basic technology resources, such as the institution's website and the CMS, are the most pervasive and most valued.

- Freely available course content/open educational resources, e-books, simulations and education games, and e-portfolios are still in the experimental stages for most students.

Students prefer blended learning environments while beginning to experiment with MOOCs. When it comes to modality, college students seem to recognize effectiveness when they see it. Their preference for blended learning environments tracks well with the findings of recent large meta-analyses of the efficacy of different ways of integrating technology into higher education (e.g., the analysis by Barbara Means et al., 2010[1]). And students' long-standing desire to retain some degree of face-to-face contact with their professors persists, even with the increasing sophistication of online methods of interaction. Even for people who have never known a world without the Internet, the human touch is valuable.

- Although not fully mainstream, blended learning persists as the preferred modality.
- More students are taking online-only courses; however, few undergraduates have taken a MOOC.
- Few students say they'd use a digital badge (common in MOOC credentialing) in their application portfolio for an employment interview.

Students are ready to use their mobile devices more for academics, and they look to institutions and instructors for opportunities and encouragement to do so. Students and faculty gain sophistication with technology each year, and each year there is greater expectation for technology to be used as a teaching and learning tool. Students look to their instructors and their institutions for guidance about how to best use the technology they own to enhance their college/university experience, not only from an academic standpoint but also from an experiential standpoint. Finding how to best incorporate technology into the academic environment will require a partnership involving students, their instructors, and the institution. Mobile devices present a conundrum in this regard, because in the classroom, they can easily and indistinguishably be used for both class-related and extracurricular activities.

- Students hold high expectations for anytime, anywhere access to course materials and for leveraging the use of their personal digital devices inside and outside class.
- Undergraduates own two to three Internet-capable devices, and ownership of smartphones and tablets jumped the most (among all devices) from 2012 to 2013.
- Laptops are still cited as the most used and most important device for academics, but more students are beginning to use smartphones and tablets for academic purposes.
- In-class use of smartphones and tablets is not yet common; students say they are often prevented or discouraged from using these devices while in class.
- Mobile-device access to institutionally provided services, applications, and websites is up, though performance ratings are waning a bit compared with 2012.

Students value their privacy, and using technology to connect with them has its limits. The nature and degree of undergraduates' expectations of privacy is the subject of some debate. What is beyond doubt is that students are extremely sensitive to the boundaries between their personal and their academic lives. Even when safeguards are promised, students resist the integration into education of technologies that they perceive to be primarily personal, clearly indicating that because some technology is used widely by students does not mean that it should be leveraged for academic use.

- Technology makes the connected age possible, but using technology to help students *feel* more engaged in their classes (or campus life) and connected with others on campus can be challenging.
- Students prefer to keep their social and academic lives separate, and they maintain those boundaries in their use of technology.
- Students are only moderately interested in early-alert learner analytics and guidance about course offerings.
- Students prefer face-to-face interactions, e-mail, and the CMS as ways to communicate more with their instructors.

The Connected Age

For higher education, the "connected age" describes the technology-assisted hyperconnectivity of learners, faculty, and institutions to those around them.

Introduction

This year's study of undergraduates and information technology marks the 10th annual study conducted by the EDUCAUSE Center for Analysis and Research (ECAR) to better understand undergraduate students' technology experiences and perspectives. Since 2004, the student study has grown from a boutique survey of freshmen and seniors at 13 U.S.-based institutions in five states to a survey of over 100,000 undergraduates at more than 250 college/university sites across 47 states and 14 countries (Figure 1). The findings in this report were developed using a representative sample of students from U.S.-based higher education college and university sites[2] and an opportunistic sample of non-U.S. responses.
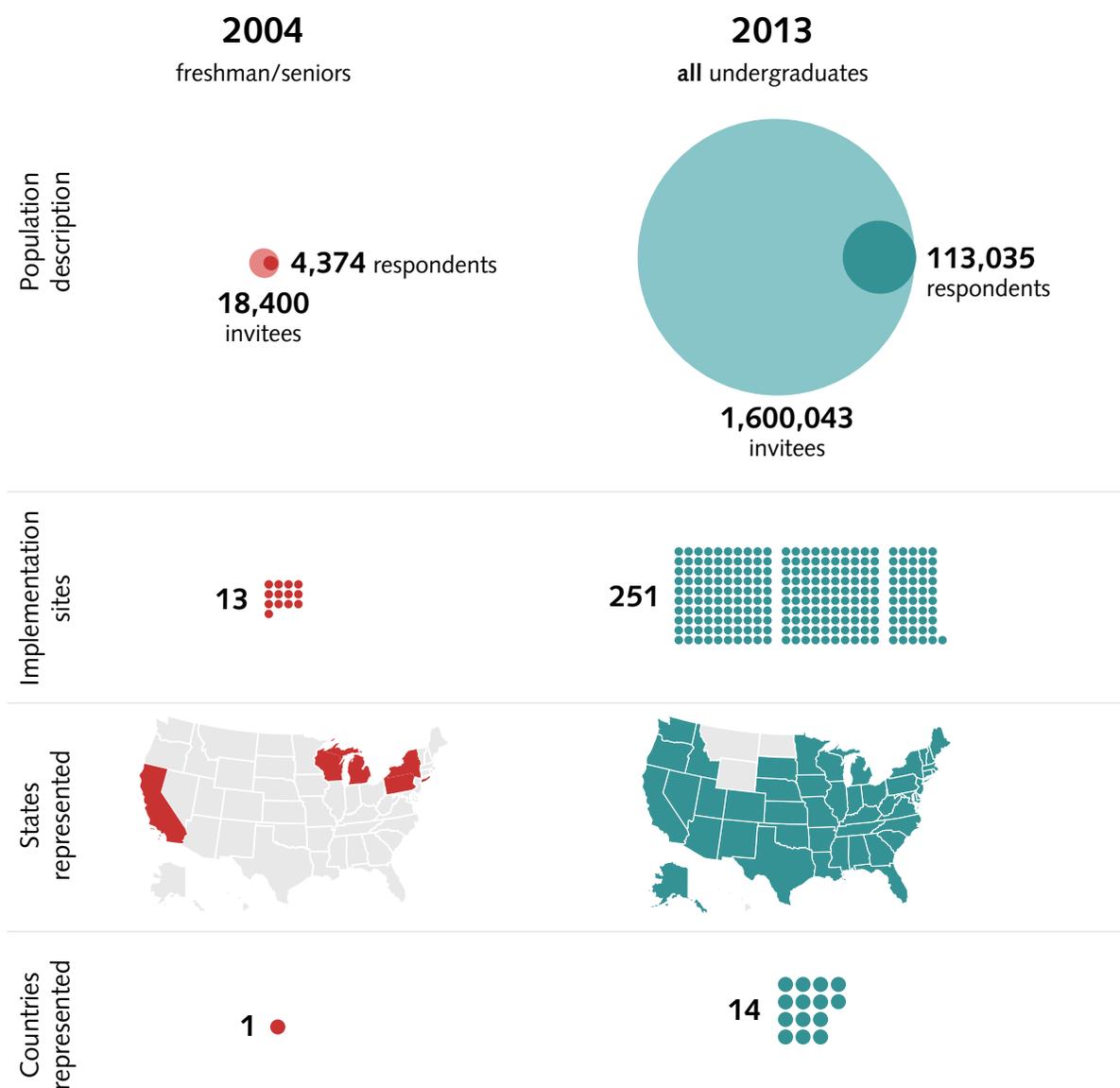
Figure 1. Student Study Institutional Participation History

This research project was designed to gather information directly from students via an online survey about their experiences with technology. We asked them about the technology they own, how they use it, and what their general perceptions of technology are at their respective colleges and universities. This research is important in gaining a better understanding of the student portion of the academic community. Students' perceptions reflect their reality, and the ECAR student study amplifies the voices of undergraduates with regard to their experiences and expectations about technology in the ecosystem of the academy. This study provides insight about students' technology behaviors and perceptions through two lenses: emerging technology issues and longitudinal trends.

The objectives for this year's study were to:

- Create a profile of undergraduates' ownership and use of technology for academics.
- Report what undergraduates say about how technology helps them to achieve their academic outcomes.
- Assess students' perceptions of how well institutions and instructors use technology to enhance the academic experiences.
- Track trends of student behaviors, attitudes, and perceptions about e-learning.
- Benchmark student behaviors, attitudes, and perceptions about using their own devices at the college/university.
- Identify longitudinal technology trends in higher education.
- Provide higher education institutions with actionable recommendations about how to meet or exceed students' preferences and expectations for technology in academics.

ECAR recognizes that there is a relationship between students' preferences for technology and their motivation to use technology in its many forms. The findings from this study can help institutions focus on technology issues that matter most to students. Contextualizing the findings is an institutional-specific undertaking in that unique institutional cultures and priorities affect the answers to questions such as why is this information important to *me* and what *my* students say about this. The material from this report can supplement broader decision making about technology investments and use. Any higher education institution can contribute data to this annual project by contacting study@educause.edu, and participating institutions receive the added bonus of seeing how their students' responses compare with student responses at peer institutions in a separate peer benchmarking report. These peer benchmarking reports provide a framework for contextualizing the findings for your students.

Findings

Students' relationship with technology is complex. They recognize its value but still need guidance when it comes to better using it for academics.

The affinity of undergraduates for multimedia, mobile devices, and multitasking is well documented. What is less well recognized is the circumspect way in which students think about integrating technology into their academic lives, a characteristic of college students that has persisted for many years. Educational technology need not be flashy in order for them to value it (e.g., the CMS, asynchronous discussions, and online course content), and even the most dedicated technophiles want to know how the latest innovation will help them to achieve their educational goals.

Students value the ways in which technology helps them achieve their academic goals and prepares them for their future academic and workplace activities. About three out of four undergraduate students agree or strongly agree that technology helps them achieve their academic outcomes (U.S. 76%, Canada 75%, other countries 72%), and about the same proportion agree that technology better prepares them for future educational plans (e.g., transferring to another degree program, getting into graduate school, etc.; U.S. 76%, Canada 71%, other countries 71%; see Figure 2). The majority of students, about three out of five, also agree that by the time they graduate, the technology they have used in their courses will have adequately prepared them for the workplace (U.S. 61%, Canada 58%, other countries 56%).[3] Differences across Carnegie classes, regions, and most demographics were not meaningful, but students 25 and older reported agreement at greater levels than students 18 to 24.
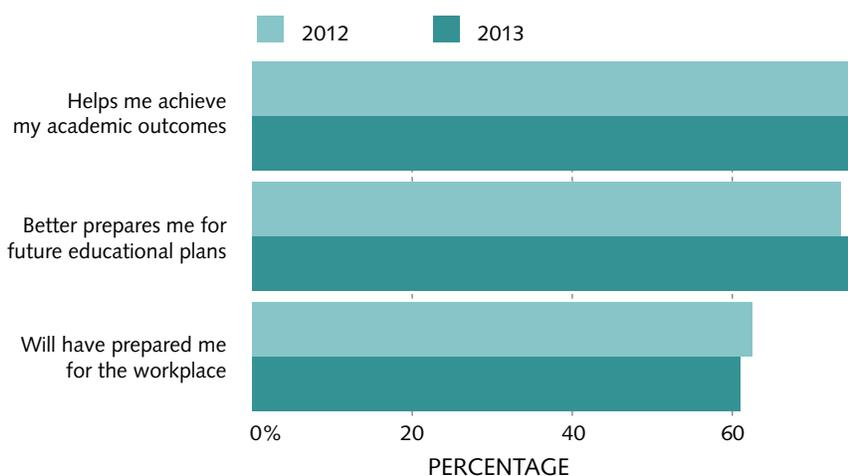
Figure 2. Technology and Outcomes Achievement

Students are generally confident in their preparedness to use technology for coursework, but those who are interested in more technical training favor "in class" guidance over separate training options. About two in three U.S.-based undergraduates agree/strongly agree that they were adequately prepared to use the technology needed in their courses when they entered college (U.S. 64%, Canada 63%, other countries 55%); these results are roughly the same as last year's. However, significantly fewer students across all Carnegie classes and regions in 2013 than in 2012 reported that it was very/extremely important to be better trained or skilled at using available technologies to learn, study, or complete coursework.[4] The largest change from 2012 to 2013 was among students attending associate's degree institutions (19% fewer students stressed the importance of training), and the smallest change was among students attending MA private institutions (9% fewer students made this point).

Students who indicated that it was very/extremely important to be better trained or skilled using available technologies to learn, study, or complete coursework expressed their *top choices* for how to receive more/better training as depicted in Figure 3. Not depicted in the figure is the *winning combination* of delivering technology training: face-to-face instruction, as designed for or included in traditionally designed courses, offered over a full term, and taught directly by their instructors. One in four students selected this combination.[5] These data suggest that students aren't really interested in taking separate "digital literacy" courses or even using on-demand web or help desk resources. Rather, students seek greater clarification about technology use expectations and needs from their instructors in their existing courses as the need or occasion to use the technology arises.
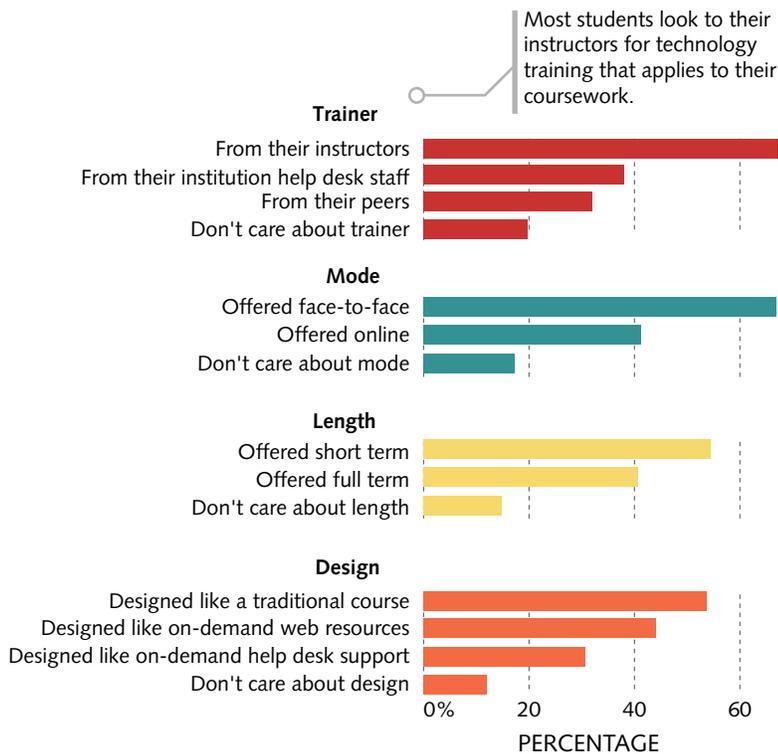
Figure 3. Technology Training Preferences

Basic technology resources, such as the institution's website and the CMS, are the most pervasive and most valued. Looking at the four-year history of students' reported use of institutionally supported technology resources and tools, we can trace the evolution of students' use of each of the items in Figure 4. The institution's main website, the CMS, and the institution's library website were used by nearly all students in 2013. These same three institutionally supported IT resources also appear at or near the top of students' ratings for very/extremely important to their academic success.
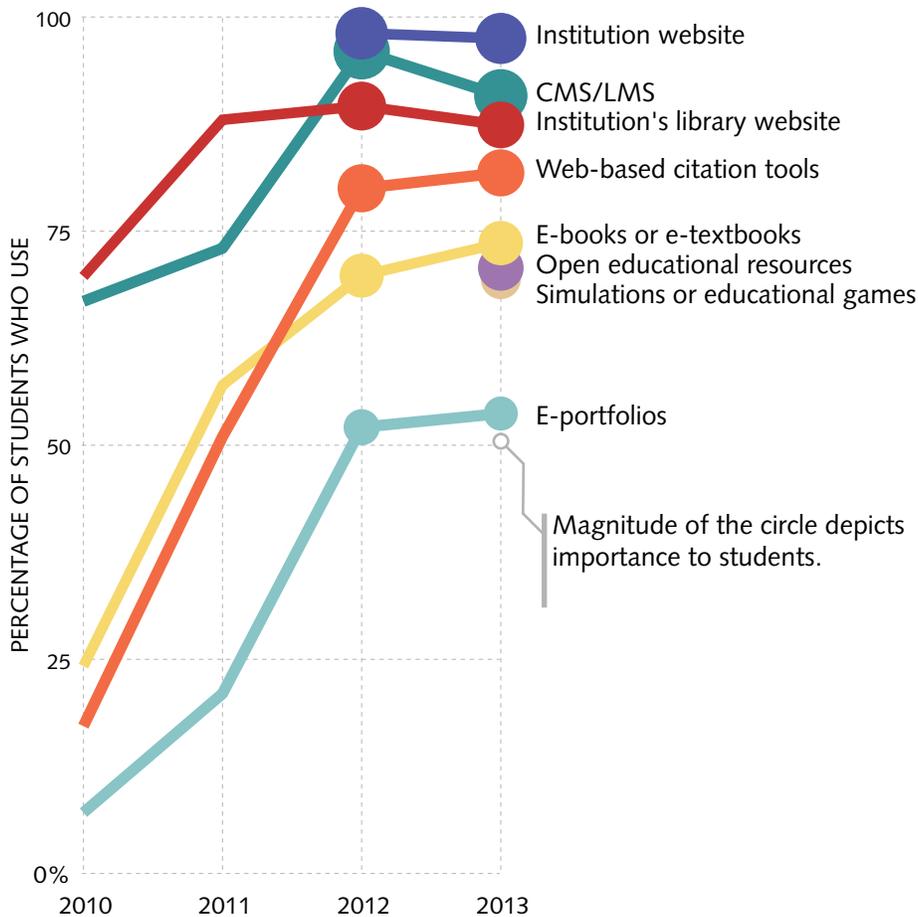
Figure 4. Technology Resource Use and Importance

As in the 2012 study, students reported that "basic" technologies such as the institution's website and the CMS have the greatest impact on student success. "Like textbooks and chalkboards/whiteboards, the institution's library and the learning management system are resources that students expect and encounter in most of their courses, and the data show that these resources are both used and considered important for academic success."[6] In looking at the last two years of data only, we see a flattening of students' reported use of these tools and resources, suggesting that we

What Do Students Say about Their Instructors' Use of Technology?

52% say most/all of their instructors provide adequate technology training

66% say most/all of their instructors have adequate technical skills

67% say most/all of their instructors use technology effectively

67% say most/all of their instructors use the right kinds of technology

Students who are positive about their own technology use and experiences are more likely to say their instructors have adequate technology skills.

may have reached a saturation point of use. This may be more true for the institutionally supported IT resources offered universally to all students than for the technology tools listed here that may be available only in certain courses or programs. The next section explores students' experiences with e-books, e-portfolios, open educational resources (freely available course content), and simulations/education games.

Freely available course content/open educational resources, e-books, simulations and education games, and e-portfolios are still in the experimental stages for most students. Seven in 10 students (71%) say they have used freely available course content/open educational resources (OERs) in the past year, yet for most students the scale of use is nominal. Only about 1 out of 10 of these students use OERs "all the time" (Figure 5). Regional and Carnegie class differences were not noteworthy, but older students (14%) compared with younger students (9%) more frequently report that they use OERs "all the time." In looking at responses to an open-ended question about how students recommend that their instructors use freely available course content, we found that most identified, at least vaguely, ways that they imagined bringing free course content into their studies: as learning aids, as supplemental information sources, and as providers of different perspectives on topics. They cited the value of sourcing additional examples and revisiting/repetition of complex or key points outside the confines of class. The majority of respondents identified a resource or activity related in some way to their academic goals. Khan Academy commonly surfaced as a supplemental OER that students employ independently or, less commonly, as prompted by their instructors. One student's comment exemplifies the supplemental value of this alternative: "Sometimes taking notes and listening to a lecture [by] the same person can be like bashing yourself over the head with a textbook if it doesn't make sense. But it's nice to listen to other styles of teaching like Khan Academy. It gives a valuable perspective."

> "Students recommend that their instructors use freely available course content, we found that most identified, at least vaguely, ways that they imagined bringing free course content into their studies: as learning aids, as supplemental information sources, and as providers of different perspectives on topics."

For every 10 students...
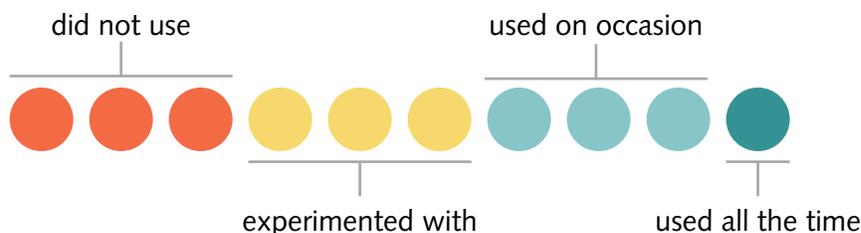
Figure 5. Scope of Open Educational Resource Use

As with OERs, experimentation is also the norm for students' use of e-books, e-portfolios, and simulations/educational games.[7] The most common answer regarding the scope of use in the past year was that students have used these in just one course (Figure 6).

These technology tools/resources are not part of students' daily digital habits

Used in half or more   Used in a few   Used in one   Did not use

Extent of use in courses

E-Books — 26%, 35%, 17%, 22%

Games/sim. — 31%, 46%, 8%, 16%

E-Portfolios — 46%, 5%, 9%, 39%
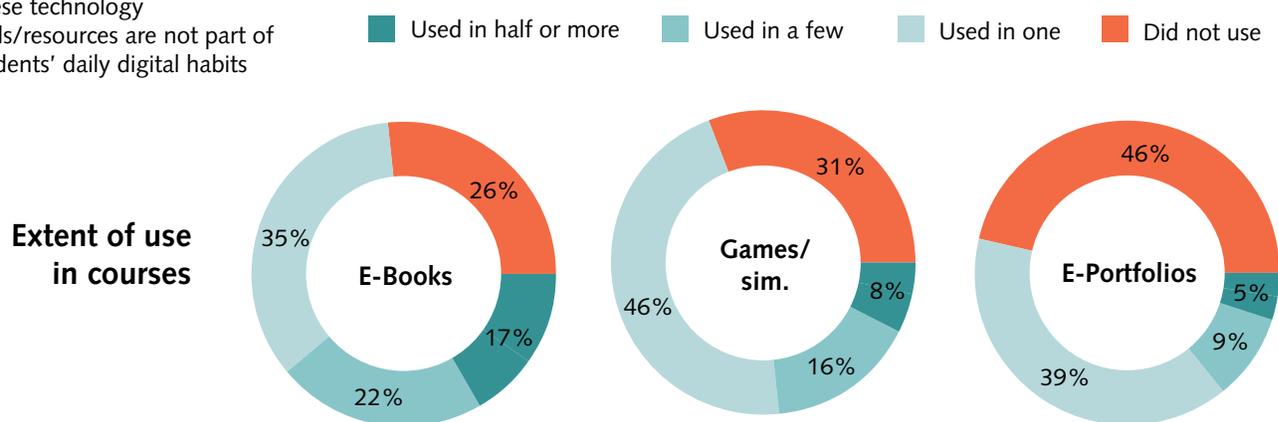
Figure 6. Use of E-Books, Simulations and Educational Gaming, and E-Portfolios

Students' interest in their instructors' using e-books, e-portfolios, simulations/educational games, and OERs is substantially higher than just a few years ago (see 2011 to 2013 growth; Figure 7). Comparing 2012 and 2013 data exclusively, we find that students' interest in their instructors' using these tools has waned a bit, with fewer stating "use it more" and more stating "use it less" this year than last year.

Students' experimental experiences with technology tools and resources are a function of their interest in incorporating the technology into their academic life as well as the opportunity to do so. The EDUCAUSE Core Data Service (CDS) can help us contextualize the latter to better understand the extent to which e-book, game and simulation, and e-portfolio resources are deployed in higher education institutions. According to 2012 CDS data, many institutions have sparsely deployed—but few have broadly deployed—e-books (42% sparsely and 10% broadly) or e-textbooks (45% and 5%), e-portfolio learning technologies (45% and 12%), or gaming programs or resources (31% and 1%).[8] This explains why such small percentages of students reported using these sorts of institutionally supported technology resources in more than a few of their courses: availability is likely limited because most institutions do not offer the resource.

Use it **more** ○――○
Use it **less** ○

Use it more 2013

2011   2012   2013

Open educational resources*

49%

Simulations or educational games

49%

E-books or e-textbooks

47%

E-portfolios

25%
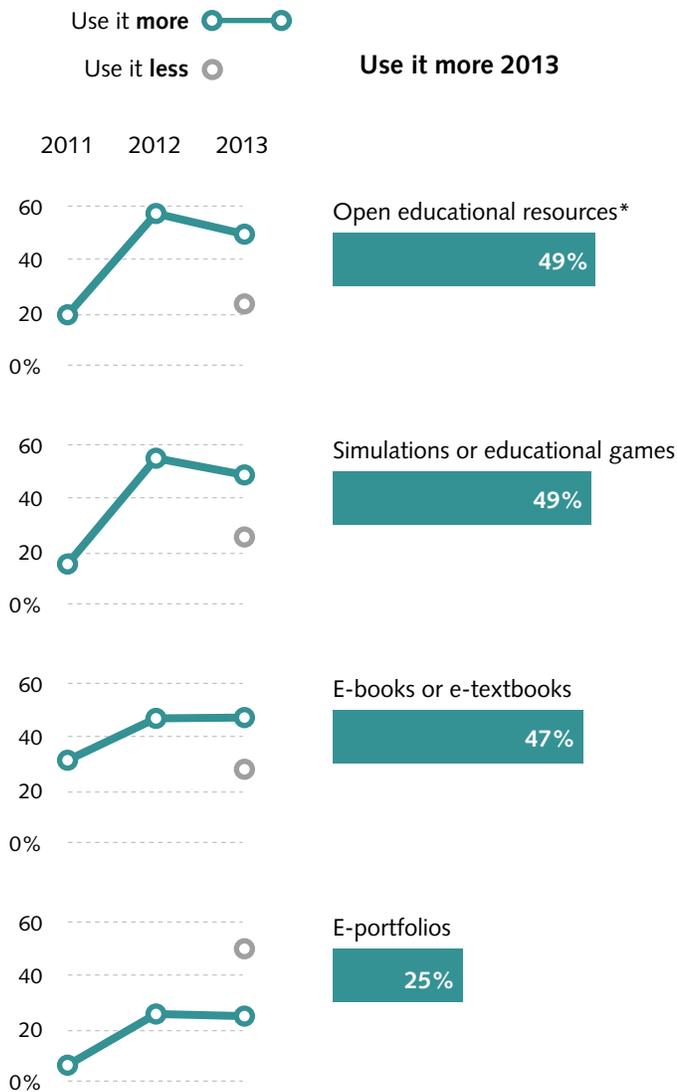
Change from 2012 to 2013 significant (p<0.001)

Figure 7. Students' Interest in Instructors' Use of Technology Tools

What Is the Current Context for E-Text/ E-Textbook Use in Higher Education?

According to a recent ECAR/Internet2 e-text evaluation project, the cost of textbooks was the most important value driver for e-textbooks, but cost-savings potential did not trump function- ality when it came to student use of e-text for coursework.* "Students appreciated the greater portability of e-textbooks and the fact that their textbooks were more conveniently available. However, students' frustrations using their devices to access e-textbooks outweighed their appre- ciation. The segregation of content in a textbook platform system from the learning management system as well as from students' primary devices was inconvenient and frustrating to many students." Faculty adoption of e-texts was also found to be a key influencer of students' experi- ences, and "…[I]n courses where faculty were engaged with the e-textbooks, more students reported positive learning outcomes." This finding is particularly helpful when it comes to better understanding students' perspectives about technology adoption and use for academics. In the case of e-books, they look to their instructors for leadership and guidance.

* Susan Grajek, *Understanding What Higher Education Needs from E-Textbooks: An EDUCAUSE/Internet2 Pilot*, Research Report (Louisville, CO: EDUCAUSE Center for Analysis and Research, July 2013), available from http://www.educause.edu/ecar.

What Is the Current Context for E-Portfolio Use in Higher Education?

A more in-depth look at e-portfolio use shows that just over half of U.S.-based students (54%) said they have used an e-portfolio in the last year (Canada 52% and other countries 64%). This figure is relatively consistent across Carnegie classes. Longitudinal ECAR data show us that there has been a dramatic increase in e-portfolio use since we first asked about it in 2010, but the 2012 to 2013 finding was that e-portfolio use was flat over the past year (although sales and implementations were both reported as robust during 2012 by the leading e-portfolio providers in the world).[*] Students' interest in e-portfolios may increase in the future as a function of the need to document their skills, abilities, and experiences for competency-based learning initiatives. Also, a recent study by the Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL.org) provides insight into how the paradigm shift from teacher-centered traditions to learning-centered traditions may also stimulate interest in e-portfolio use to document experiences and competencies. "Compared with teacher-centered traditions, learning-centered e-portfolio practitioners are significantly more likely to evaluate student work collaboratively, often on cross-disciplinary teams. They consider multiple examples of student work and value students' work over time."[†] According to AAEEBL President/CEO Trent Batson, "The chief value of e-portfolios, culture-wide, is how they catalyze learning in so many research-proven ways."

[*] Trent Batson, president/CEO of The Association for Authentic, Experiential and Evidence-Based Learning (AAEEBL), e-mail correspondence, July 17, 2013.

[†] Gary Brown, Helen L. Chen, and Aifang Gordon, "The Annual AAEEBL Survey at Two: Looking Back and Looking Ahead," *International Journal of ePortfolio* 2, no. 2 (2012): 129–138, http://theijep.com/pdf/IJEP93.pdf.

Students prefer blended learning environments while beginning to experiment with MOOCs.

When it comes to modality, college students seem to recognize effectiveness when they see it. Their preference for blended learning environments tracks well with the findings of recent large meta-analyses of the efficacy of different ways of integrating technology into higher education (e.g., the analysis by Barbara Means et al., 2010). And students' long-standing desire to retain some degree of face-to-face contact with their professors persists, even with the increasing sophistication of online methods of interaction. Even for people who have never known a world without the Internet, the human touch is valuable.

Although not fully mainstream, blended learning persists as the preferred modality. Nearly four out of five U.S.-based students (79%) have taken a course with some online components and some face-to-face components (a blended learning course; Canada 76% and other countries 87%), an increase of about 5% since 2012 (p =.001). The majority of students across all regions and Carnegie classes report that they both *prefer* and *learn most* in blended learning environments (Figure 8).[9] These findings track with data regarding students' desire to communicate with instructors face-to-face as well as having anytime, anywhere access to course materials.

Most students have had a blended learning experience

How many of your courses have been blended courses?

○ Prefer...   ○ Learn most in...
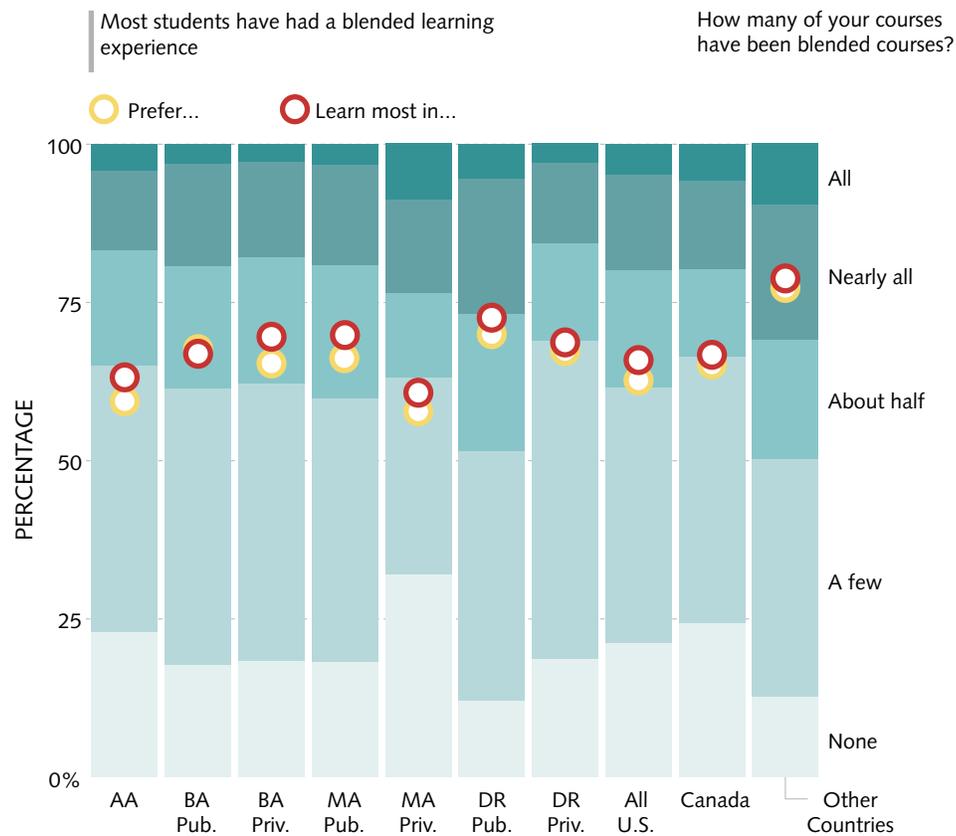
Figure 8. Students' Blended Learning Environments Experiences, by Carnegie Class

For students who indicated a definite preference for a certain type of learning environment, the most pronounced demographic differences were found by age category. Despite younger students' greater affinity for digital technology, it is older students who lean more toward online-only courses.[10] A partial explanation is the relationship between older students and part-time status—part-time students take courses offered completely online at twice the rate as full-time students (19% PT versus 9% FT). Older students are more frequently part-time students than their younger counterparts, and part-time status is an indicator for work or family commitments. Such commitments increase the need for a flexible learning environment.

More students are taking online-only courses; however, few undergraduates have taken a MOOC. More students in 2013 than in 2012 took an online course offered either at the institution that asked them to participate in the survey or at a different institution in 2013 than in 2012 (Figure 9). The demographic profile of these online course-takers is predominantly older students (61%) versus younger (38%), female students (50%) versus male (40%), non-Asian students (≥ 45%) versus Asian (38%),

Learning Environment Preferences

Of the students who indicated a preference for a particular type of learning environment (online only, blended, or face-to-face), 84% expressed a preference for the kind of learning environment that matched the one in which they said they learn the most. Students who prefer blended courses tend to have more blended-course experiences than other students. About 88% of students who prefer blended learning courses took one in the past year, whereas only 65% of students without a learning-environment preference took a blended learning course. These data tell us that students' blended-learning course experiences track with both their *preferred* learning environment and the one in which they believe they *learn* the most, but we can't be sure if blended learning course experiences beget a favorable impression of these types of course learning environments or vice versa.

nonfreshman students (≥ 49%) versus freshman (32%), and part-time students (53%) versus full-time (44%). It is interesting that the demographic profile of students taking traditional online courses (above) is basically the reverse for students taking massive open online courses (more on MOOCs in the next section).
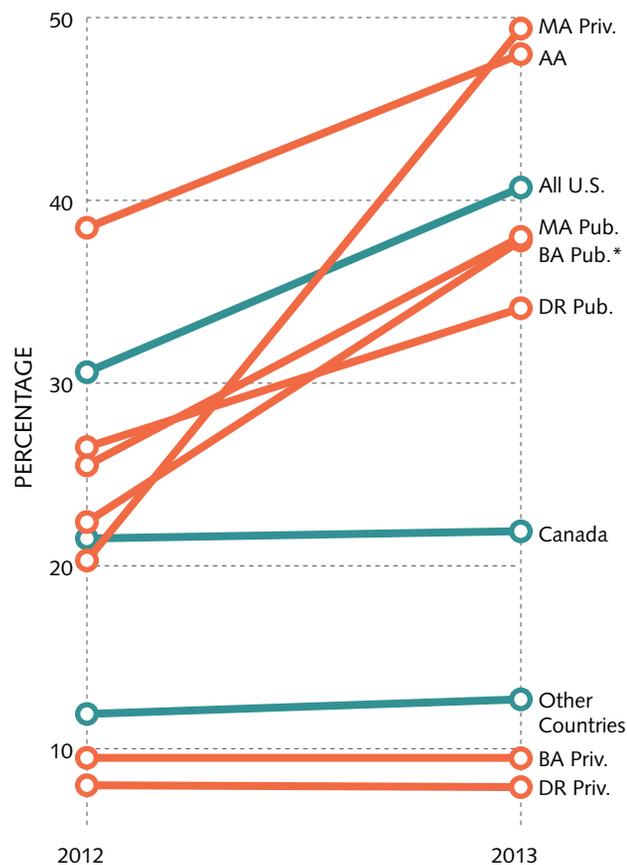
*Fewer than 10 institutions

Note: These data reflect students taking online courses through the institution that asked them to participate in the survey. About 7% of U.S. students have taken an online course at another institution; that figure is 6% for Canada and 5% for other countries.

Figure 9. Percentage of Students Taking Online Courses in 2012 and 2013, by Carnegie Class

It is not enough to consider students' online course-taking activities at traditional higher education institutions, because there is a new breed of course offerings entering both the lexicon and the culture of teaching and learning. Massive open online courses, or MOOCs (see sidebar), are consuming the cognitive surplus of politicians, reporters, and, most importantly, educators and college/university leaders. It is a rare week when one opens a *Chronicle of Higher Education* issue without seeing a

Students Ask, "What Is a MOOC?"

What is it?

A MOOC is a model of educational delivery that is, to varying degrees, *massive*, with theoretically no limit to enrollment; *open*, allowing anyone to participate, usually at no cost; *online*, with learning activities typically taking place over the web; and a *course*, structured around a set of learning goals in a defined area of study. The range of MOOCs embody these principles in different ways, and the particulars of how MOOCs function continue to evolve. Still, even without a definitive model of what they are or do, MOOCs have prompted a reexamination of many of the conventions of higher education, including the role of faculty and the institution, accreditation, and criteria for awarding credit.

Source: http://net.educause.edu/ir/library/pdf/ELI7097.pdf

story about MOOCs and the implications for higher education. With all of the fervor around MOOCs among those involved in higher education, the most important population to consider—undergraduate students—has been largely left unstudied. Figure 10 shows that few students currently enrolled in traditional higher education institutions have taken a MOOC in the past year (U.S. 3%, Canada 4%, other countries 6%), and more importantly, most students (three out of four) don't know what a MOOC is (U.S. 74%, Canada 75%, other countries 73%).

> With all of the fervor around MOOCs among those involved in higher education, the most important population to consider—undergraduate students—has been largely left unstudied.
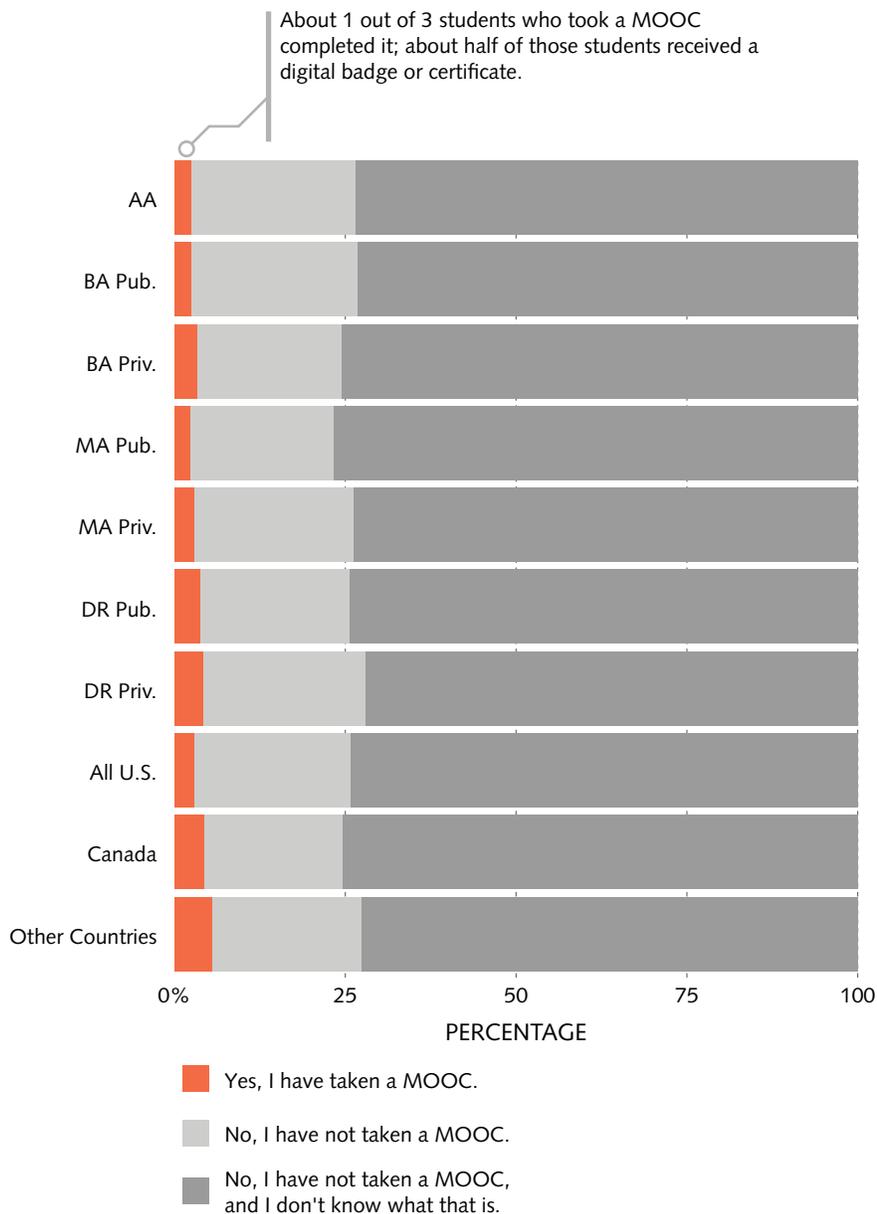
Figure 10. MOOC Experiences among Undergraduates, by Carnegie Class

ECAR focus group students were asked about MOOCs by acronym, by the spelled-out name (massive open online course), and by the names of common MOOC providers (e.g., Coursera, Udacity, edX, MITx, etc.). Despite this variety of opportunities to recognize this unique medium for instructional delivery, blank stares were returned. When prompted about their interest in taking a fully online course, offered by a premier instructor and with highly polished and produced course content, they seemed interested until they were informed that they would be in the course with 10,000, or 30,000, or 100,000 other students. At that point they scoffed at the idea and—unprompted— reiterated that one of the things they like about their current education paradigm is the ability to make personal connections with their instructors. It appears, at least for the time being, that MOOCs are not a threat to traditional higher education institutions or programs of study but instead are emerging as an alternative educational platform that can supplement and expand the market for higher education rather than supplant the college/university experience.

The *NMC Horizon Report: 2013 Higher Education Edition* predicts that MOOCs will see widespread adoption in higher education in the next 12 months.[11] MOOCs have a long way to go to attain the status of "widespread adoption,"[12] and ECAR will continue to track traditional undergraduate students' experiences and perspectives about MOOCs. Students' current lack of interest in MOOCs is consistent with other student study findings such as student preferences for more face-to-face interaction experiences with their instructors. As MOOC providers strive to attain widespread acceptance as a viable mode of delivering to students content that results in learning, ECAR will gauge undergraduate students participation in and acceptance of MOOCs and their successors. When Everett Rogers's bell curve for technology adoption[13] is applied, the disruptive technology model suggests that the adoption factor for MOOCs will be exponential rather than linear (Figure 11). Today's MOOC-taking population among undergraduate students appears to primarily reflect innovators, with just a few very early adopters. Given recent events—including MOOC providers such as Coursera raising venture capital at head-turning amounts[14]—it is critical to continue to track whether (and to what extent) traditional undergraduate students take MOOCs. In this way we will be able to tell the story about how MOOCs are impacting traditional higher education experiences.
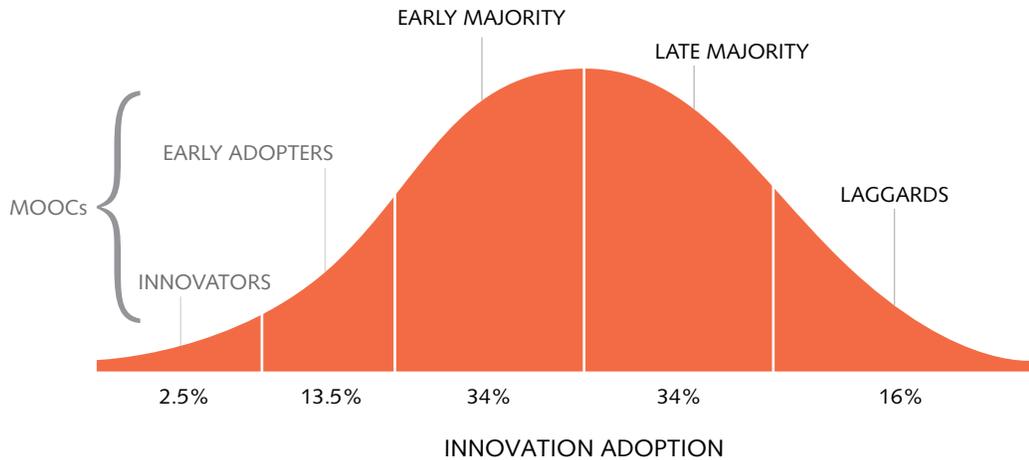
Figure 11. Innovation Adoption Pattern and MOOCs

Few students say they'd use a digital badge (common in MOOC credentialing) in their application portfolio for an employment interview. Badge credentials that represent a skills-based competency or completed activity pale in comparison to all other forms of credentialing (i.e., undergraduate degree/diploma, certificate from an accredited institution, industry certificate, and OER certificate) that students would include in an employment application portfolio (U.S. 17%, Canada 16%, other countries 22%; see Figure 12).[15] Badges are a rather new credentialing option, and as they gain in use, familiarity (among students and employers) may beget comfort, comfort may beget credibility, and students' increased levels of interest may follow. Cross-institutional badge-curating systems and common (if not standardized) criteria and procedures for issuing badges will likely gain importance to support the use of digital badges as evidence of competency certification.
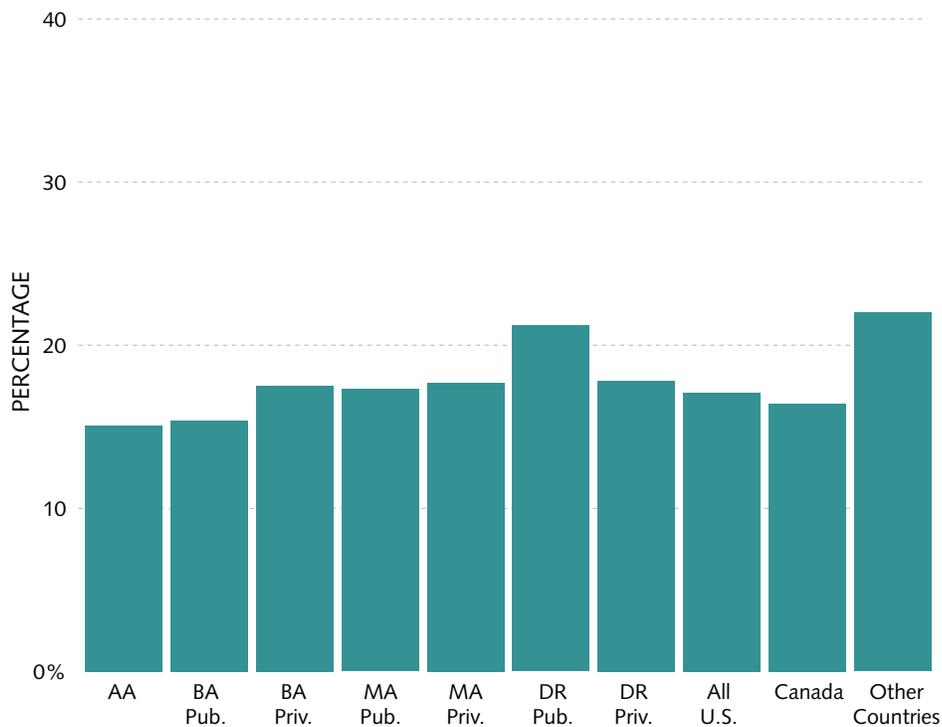
Figure 12. Digital Badge Inclusion in an Application Portfolio, by Carnegie Class

What Might We See for Curating Experiences and Competencies?

As disparate data elements become part of a student's increasingly broad digital footprint in the connected age (e.g., academic transcripts from more than one institution, digital badges or other non-college-credit-bearing credentials from MOOCs and other alternative education platforms, extracurricular experiences that enhance or apply context to a student's experience, etc.), students may find more value in something like a professional electronic portfolio that they create to self-manage an accurate digital profile of their accomplishments and activities during college. LinkedIn has already done this for professionals through its features that let users digitally curate educational and professional accomplishments and proficiencies; it has become more than just a social networking site for professionals. Providing additional services such as offering networked individuals the opportunity to endorse someone's "skills and expertise" is a functional proxy for competency certification (though it does not presently account for the credentials of the person doing the endorsing). LinkedIn is morphing into a self-managed professional electronic portfolio site, and its massive member growth in the last year[*] is evidence of its increased societal value. Strategically aligning institutional credentialing (i.e., conferring awards and certificates) and certifying competencies that seamlessly integrate into existing networked virtual communities may constitute the next generation of résumé management that will give students the added value they need to increase their interest in utilizing digital badges.

   * "LinkedIn Reaches 200 Million Members Worldwide," press release, January 9, 2013, Mountain View, Calif., http://press .linkedin.com/News-Releases/165/LinkedIn-reaches-200-million-members-worldwide.

Students are ready to use their mobile devices more for academics, and they look to institutions and instructors for opportunities and encouragement to do so.

Students and faculty gain sophistication with technology each year, and each year there is greater expectation for technology to be used as a teaching and learning tool. Students look to their instructors and their institutions for guidance about how to best use the technology they own to enhance their college/university experience, not only from an academic standpoint but also from an experiential standpoint. Finding how to best incorporate technology into the academic environment will require a partnership involving students, their instructors, and the institution.

Students hold high expectations for anytime, anywhere access to course materials and for leveraging the use of their personal digital devices inside and outside class. Using lecture capture tools, more robustly using the CMS, and integrating students' personal computing/mobile devices into the learning environment are all on students' wish list for additional action by their instructors (Figure 13). Students expect to have access to course materials inside and outside class, and they want opportunities to integrate their digital device resources during class. These quantitative survey findings are supplemented by student comments from the open-ended survey question about sharing "ONE thing their instructors can do more with technology to better facilitate or support academic success." EDUCAUSE Core Data Service (CDS) information also provides additional context for deployment and use of these IT resources.
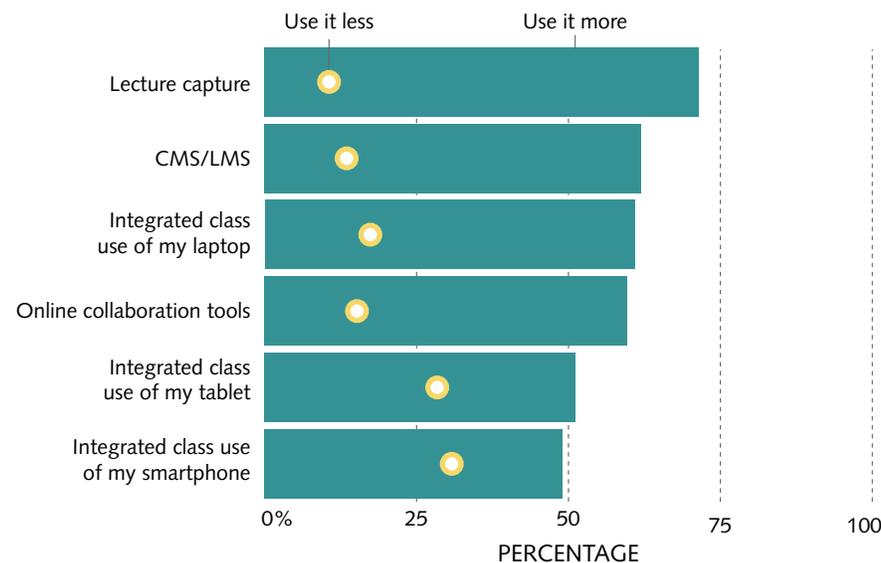
Figure 13. Technology Resources Wish List

As for students' wanting instructors to more robustly use the institution's CMS, the CDS provides insight about the scope of CMS implementation. Almost all institutions have a CMS in place (≥ 97%), with the median of 60% of courses integrated into the CMS.[16] IT leaders estimate that 70% of instructors use the CMS and that 50% of these users employ only the basic system features. These data help explain why the majority of students say they wish their instructors used the CMS more: Its resources are largely underutilized. We note, however, that some students' responses are likely referring to CMS use versus nonuse, while others are likely referring to "better" use of the features and functions the CMS offers. The student study data suggest that gathering specifics about how students and faculty use the CMS and their interest in it would be a timely investment to better inform decisions about optimizing the CMS. In 2012 only about a third of CDS respondents (35%) said that the institution measures CMS satisfaction.[17]

With regard to lecture capture issues, open-ended comments tell us that students don't just want lectures posted, but that they would also like access to the materials used by the instructor, such as slides and notes. Students would also like problem sets, sample questions, and related resources to be available. They furthermore affirmed that improving the quality of existing resources made available to them online is important. As for improving their CMS experience, students often said they want their instructors to use the system more—and more effectively. Their suggestions included using it to post/support course materials and recorded lectures, and also to post (timely) in-progress grade information. There was also articulated interest in uniformity of instructors' CMS use: "I think instructors need more training when moving to a new platform. In all three of my classes this semester [each of my instructors] handled [the CMS] differently."

Nearly three out of four students (U.S. 72%, Canada 74%, other countries 74%) are interested in more lecture capture activities, and, according to 2012 CDS results, only 21% of institutions have broadly deployed lecture capture capabilities.[18] Because so few institutions have broad deployment, and not all instructors will use the lecture capture capabilities that are available to them, it is important to consider the do-it-yourself option that in-class use of mobile devices provides to students. About one out of three students said that a smartphone can be used as an effective learning tool during class to record their instructors

What Do Students Say about CMS Standards?

A "require the teachers" message was a somewhat common refrain in students' open-ended question responses about what institutions could do to improve students' experiences with technology. Because most students are unaware of the culture and politics of the academy, their unfiltered comments step perilously close to infringing on academic freedom as practiced in classrooms. As one student noted, "Set a unified standard for online courses. Every professor likes to set up things differently, so it takes a great deal of time to get acquainted with their setup. If all teachers use the same structure, this problem would be eliminated."

(U.S. 37%, Canada 29%, other countries 27%), and around half said they would use a smartphone to photograph information (U.S. 46%, Canada 47%, other countries 52%). For most students in the U.S. (74%) and Canada (64%), however, this is not an option, as the majority of students reported that smartphone use in class is either banned or discouraged (other countries 43%). (More about the integration of student-owned devices appears in the final section of this report.)

Undergraduates own two to three Internet-capable devices, and ownership of smartphones and tablets jumped the most (among all devices) from 2012 to 2013. It is common for students to own two, three, or four-plus Internet-capable devices (Figure 14). Students with the most devices tend to be male (34%) rather than female (25%), tend to be older (41%) rather than younger (23%), and white (32%) rather than nonwhite (≤ 26%).[19] We also found that the more devices students own, the more likely they are to agree that technology prepares them for future academic and employment pursuits, to feel more prepared to use technology, and to actively engage in courses that use technology. Students who own more technology are also more inclined to see its value for use in academics.
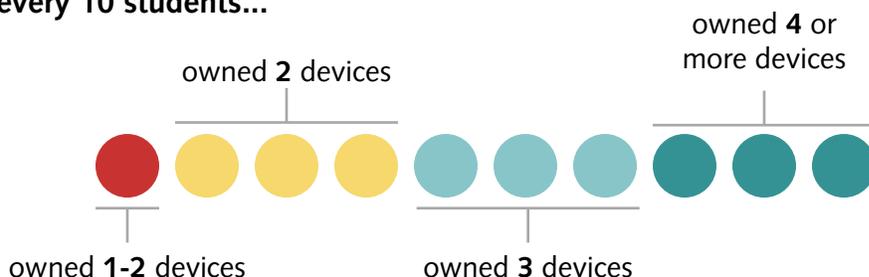
Figure 14. Internet-Capable Device Ownership

Students' device ownership continued to increase from 2012 to 2013 for each of the five devices asked about (Figure 15). Students' ownership of laptops and smartphones exceeds that of the general adult population.[20] Laptops still dominate the quiver of student-owned devices, with nine out of ten students owning one (U.S. 89%, Canada 91%, other countries 85%). Interesting demographic differences include age, with *more* younger students (77%) owning smartphones (versus 74% of older students) and *fewer* younger students (27%) owning tablets (versus 39% of older students). Interesting too is that smartphone ownership is more common outside the U.S. (U.S. 76%, Canada 81%, other countries 82%).

> "Tablets grew the most in terms of academic use compared with all other devices asked about in this year's survey."
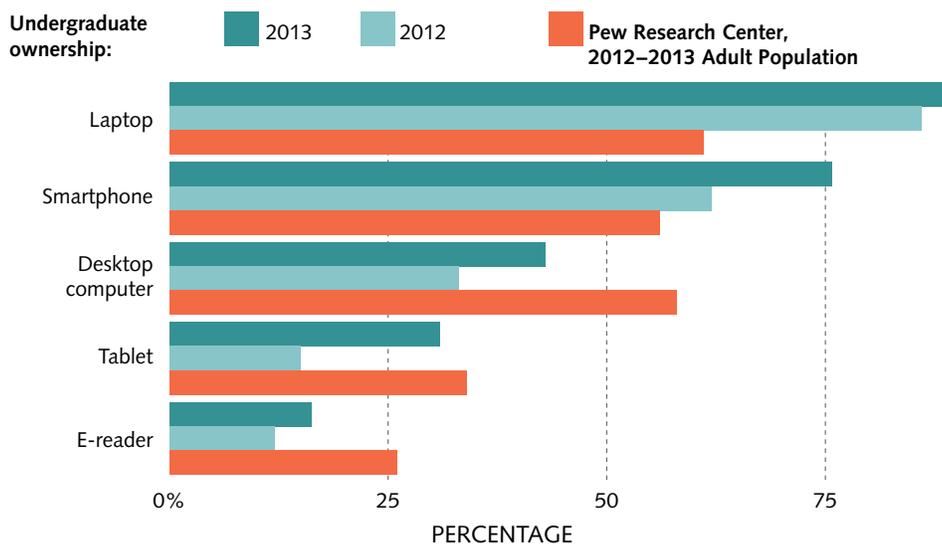
Figure 15. Device Ownership Comparisons, 2012 to 2013

ECAR has been tracking device ownership trends since 2004 (Figure 16), and the general trends in ownership recognized last year have continued this year. This year's survey also asked students about their plans to purchase a new device in the next 12 months, so predictions for 2014 ownership levels are also provided.[21]
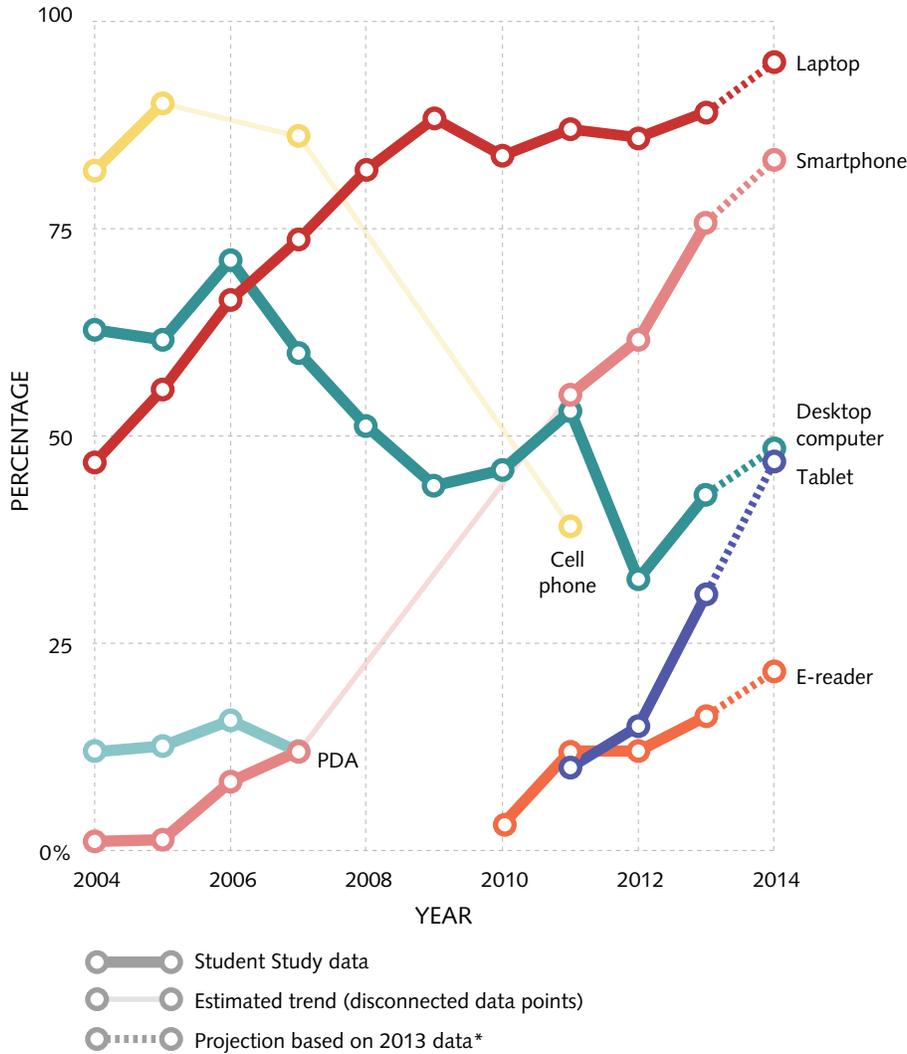
Figure 16. Device Ownership History and 2014 Predictions

Laptops are still cited as the most used and most important device for academics, but more students are beginning to use smartphones and tablets for academic purposes. When it comes to use for academic purposes, laptops topped the list for the percentage of students rating these items as very/extremely valuable (this was true across all regions and Carnegie classes). The use of smartphones and tablets for academics grew the most from 2012 to 2013, with students particularly showing an impressive increase in the importance ratings of smartphones for academic success (Figure 17). Increases in use of a particular device for academic purposes doesn't necessarily reflect the perception of increased importance of that device to students.

How Do Students Use Institutionally Provisioned Desktop Computers?

#1 to access printing services

#2 as a personal laptop substitute ("I don't always bring my laptop with me")

#3 to access library resources

Minorities of students also use these devices to access specialty software and hardware, to have better Internet access, to use a designated workspace on campus, and to connect to social networking sites.

In the case of smartphone and laptops, use and importance are both up since last measured in 2012, but this is not the case for e-readers, tablets, or desktop computers. Despite some of the challenges students face with using their smartphones in class (discussed later in this report), their enthusiasm for using smartphones as academic tools is evident in these data. ECAR will continue to track tablet use and watch for the *NMC Horizon Report: 2013* prediction of widespread adoption of tablet use in higher education in the next 12 months (near-term horizon prediction).[22] Though compared with the adult population fewer undergraduates own tablets, more than twice as many students in 2013 than in 2012 said that they use a tablet for academic purposes. In fact, tablets grew the most in terms of academic use compared with all other devices asked about in this year's survey.
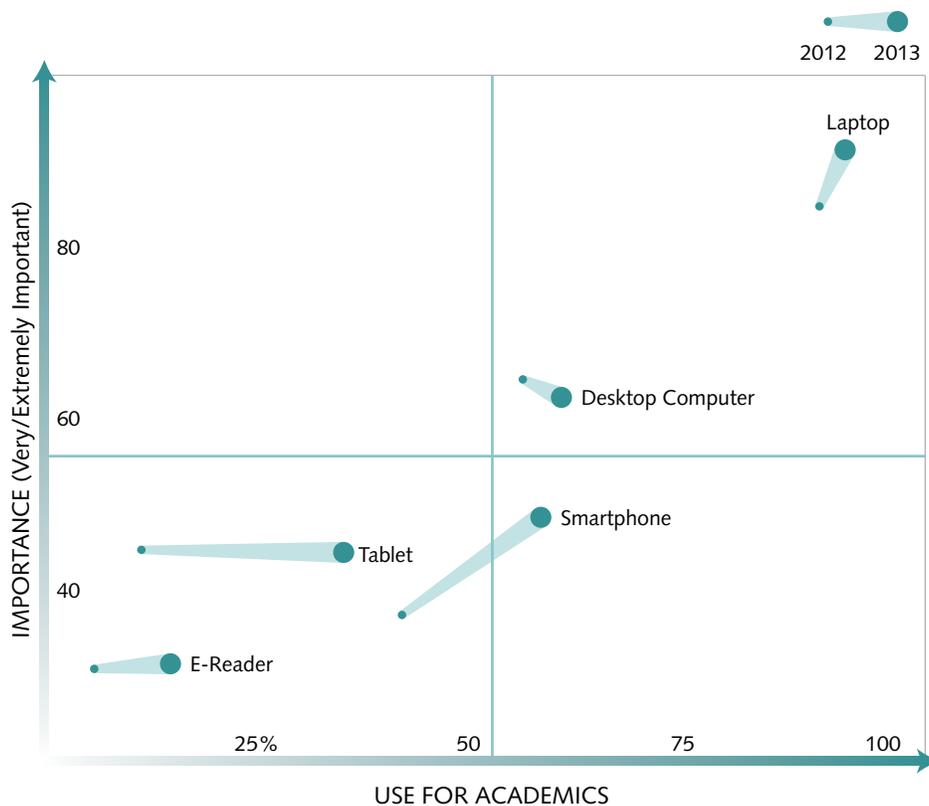
Figure 17. Changes in Importance and Use of Devices for Academics, 2012 to 2013

In-class use of smartphones and tablets is not yet common; students say they are often prevented or discouraged from using these devices while in class. More students own mobile devices than ever before, but as Figure 18 shows, few students reported that these devices were either encouraged or required for use as learning tools during class. Smartphones have the most restrictions for in-class use, and by students' own admission these devices can distract them from class activities as easily as they can enhance their learning experience.[23] Analysis of students' responses to an open-ended question

What Do We Know about Printer Ownership and Use?

Most undergraduates own a printer (U.S. 73%, Canada 77%, other countries 59%). Despite the natural inclination of IT units to minimize redundancies of institutionally provided printers, students reported that campus printers are useful for higher-quality or on-demand printing services, for wireless printing, and to support color-printing needs.

about smartphone use barriers corroborates the concern about phones (and other mobile devices) possibly being distracting—to themselves and to other students. Some students expressed sympathy about banning/discouraging these devices, supporting faculty perceptions that phones are not being used for academic purposes. As one of these students stated, the phone is not employed, "out of respect." But out of the mouths of babes…we found colorful, yet demonstrative, statements revealing students' perspectives about limiting smartphone use in class: "Professors who are stuck in the Stone Age and won't allow us to use these tools…" and "The only thing that keeps me from using my phone is the instructors' thinking I am texting…when I am actually actively involved with my phone recording and looking up information."

> Increased ownership levels of these devices presents educators with the opportunity to strategically integrate use of them in class.
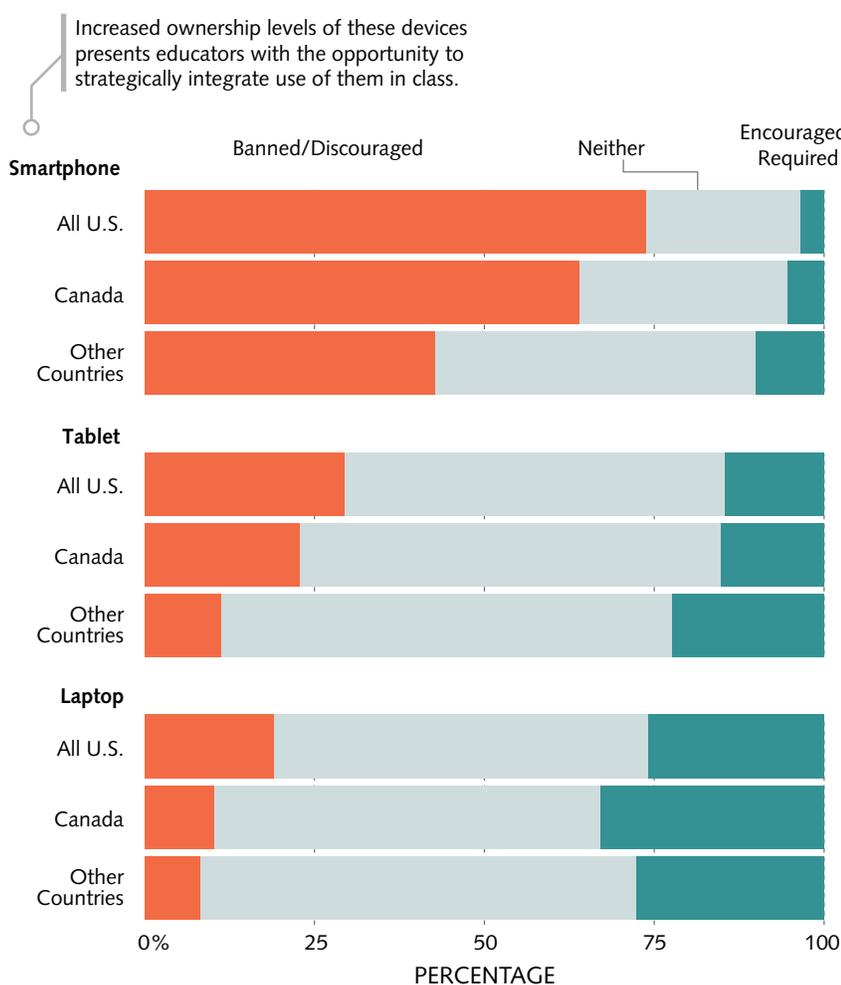
Figure 18. In-Class Mobile Device Experiences

Product Market Share

Despite smartphones' ability to distract, about half of respondents (49%) said they want their instructors to integrate the use of smartphones into class more. Even more students wanted tablets (51%) and laptops (61%) integrated
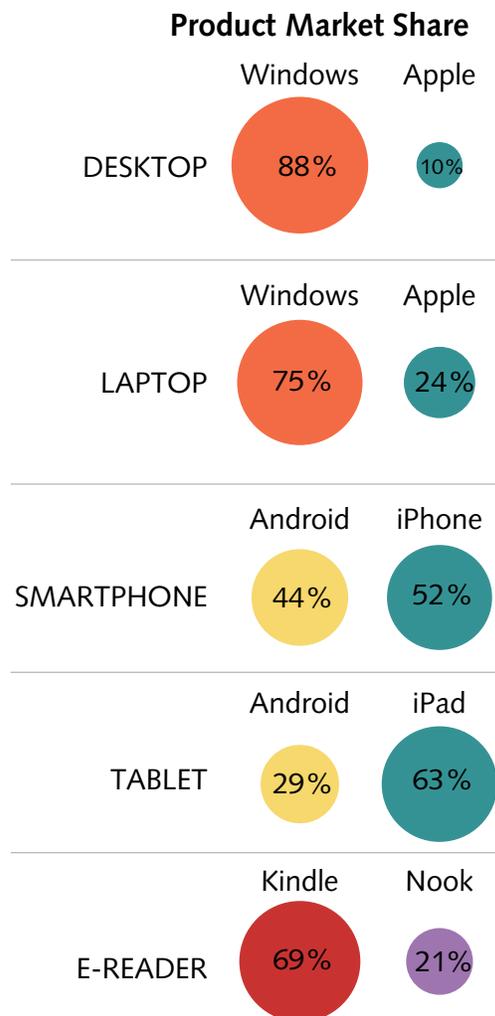
into class. In-class integration can be tricky not only because of the distractibility factor but also because these devices have not reached universal ownership status. Successful in-class integration of any mobile or computing device will require device type, device brand, operating system, and software to be agnostic. In addition, tasks must be collaborative in nature so that students without their own devices can partner with students who do have devices. Though not a common practice, some institutions provide all incoming freshmen with a laptop or tablet, and looking to these institutions' "it worked for us" examples of in-class mobile device usage could be prudent.

If given the opportunity, how would students use smartphones as academic tools? Their most frequent answers were sourcing information (looking up information or accessing digital resources) and photographing information while in class (Figure 19). These reports came from students asked to theorize how a smartphone could be an effective learning tool, regardless of whether they said they owned one or have used one in class.[24] Open-ended survey responses related to this question reinforced the items in the succeeding figure and expanded on the potential uses. Despite smartphones' small screens and keyboards, a number of students said they would use them to take course-related notes. Others want to use the calendar features for scheduling tasks or setting alerts about upcoming assignments. Students would also use smartphones as a calculator, a dictionary, a thesaurus, and a translation device; and they are willing to use them as clickers for polling, quizzes, and communication with others in class. For the third year in a row, Google was the most frequently cited online resource to go to *first* to learn about a new topic. As one student said: "Instant Google searches for topics relevant to the discussion [is something a smartphone can do in class]."

> **"Successful in-class integration of any mobile or computing device will require device type, device brand, operating system, and software to be agnostic. In addition, tasks must be collaborative in nature so that students without their own devices can partner with students who do have devices."**
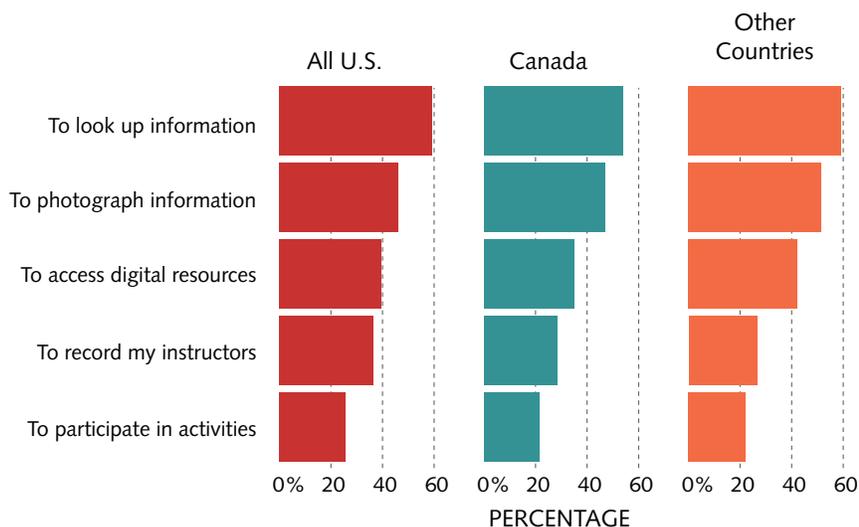
Figure 19. Ways Students' Use (or Would Use) a Smartphone as a Learning Device

Several practical barriers keep students from using a smartphone as an academic tool. Inadequate battery life, slow network connections, and device usability concerns were the top-three limitations of smartphones as academic tools (Figure 20).[25] Institutions,

to some extent, can address the first two issues by providing convenient outlets and/or charging stations, and more or better network access (via hot spots, wireless carrier coverage, more robust wireless bandwidth, etc.). The remaining issues are more structural (e.g., device usability) or more personal (e.g., costs of devices or services) in nature. These concerns provide insight about some of the challenges students perceive as they adjust their expectations about if/how/when they can use their smartphones to enhance their learning experience.
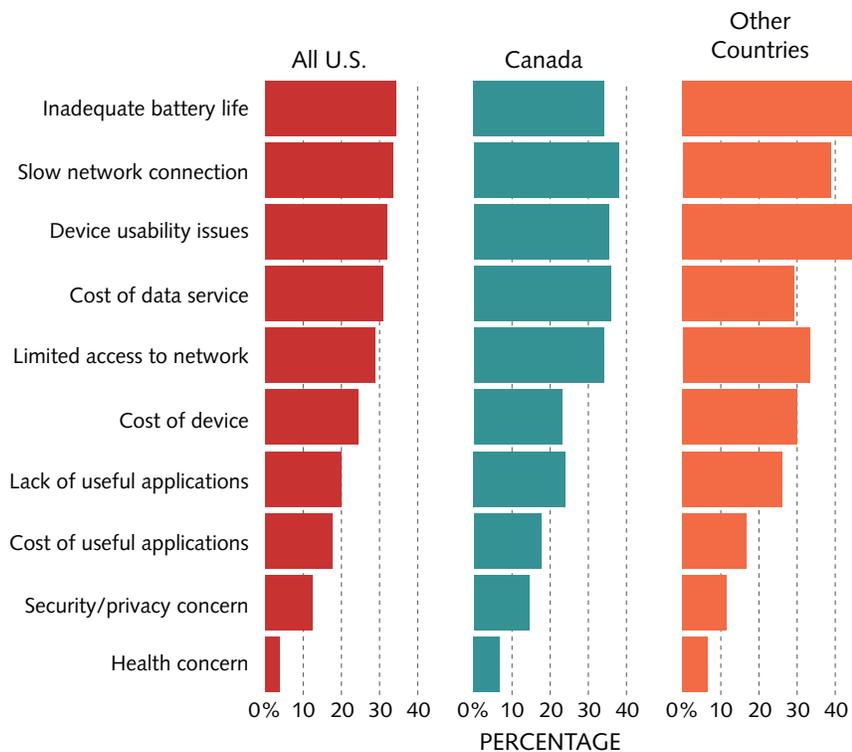
Figure 20. Barriers to Using Smartphones as Learning Devices

Mobile device access to institutionally provided services, applications, and websites is up, though performance ratings are waning a bit compared with 2012. Despite some of the challenges noted in the previous section about using smartphones as effective academic tools, use of mobile devices to access institutionally provided services, applications, and websites (SAWs) is generally up[26] while ratings of these same SAWs are generally down from 2012 to 2013 (Figure 21).[27] From a regional perspective, students in the U.S. generally rated SAWs higher than did their non-U.S. counterparts. And within the United States, students attending associate's institutions were most satisfied. Are these higher ratings a function of better mobile device access to SAWs, or are they a function of students' differing levels of expectations about SAW access from their mobile devices? This question should be investigated locally because it will rely heavily on the current context of SAWs at a particular institution. The answer(s) will

depend on things like upgrades to or new deployment SAWs, changes in policy or practice that affected the performance or user experience of a SAW, and institutional culture around students' expectations of SAW functionality.

If improving students' experiences with regard to mobile access to SAWs is a priority for your institution, then assessing the current status and benchmarking progress to your ideal is the best course of action. The data in this report provide evidence of student experiences by region and Carnegie class, which can inform setting ideal benchmark standards for your institution. When asked to name *one thing* that their institution can do with technology to better facilitate or support their academic success, students tended to want institutions to do what they're probably already trying to do: make the environment more usable (by improving, adapting, and evolving to meet student demand and expectations). Students specifically noted wanting more mobile connectivity, mobile-friendly apps, and mobile-friendly websites. These issues speak to areas of technology that students can't effectively address themselves and must look to the institution to improve their experiences. These issues also track to some extent with the priorities around student-centric and student-facing mobile IT solutions found in a forthcoming report on higher education mobile IT.[28]
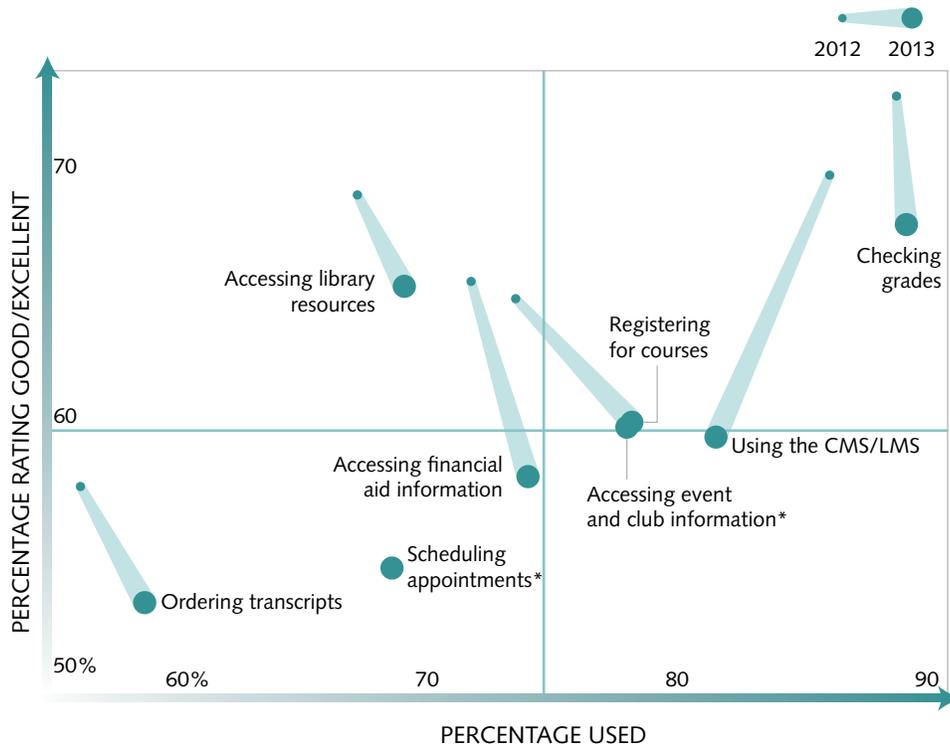
*No data for 2012

Figure 21. Use and Ratings for Mobile Device Access to Institutionally Supported Services, Applications, and Websites, 2012 to 2013

Students value their privacy, and using technology to connect with them has its limits.

The nature and degree of undergraduates' expectations of privacy is the subject of some debate. What is beyond doubt is that students are extremely sensitive to the boundaries between their personal and their academic lives. Even when safeguards are promised, students resist the integration into education of technologies that they perceive to be primarily personal, clearly indicating that because some technology is used widely by students does not mean that it should be leveraged for academic use.

Technology makes the connected age possible, but using technology to help students feel more engaged in their classes (or campus life) and connected with others can be challenging. In terms of how technology engages students, for the second year most students agreed/strongly agreed that it helps them feel more connected to what is going on at *their institution* (U.S. 64%, Canada 65%, other countries 68%). They were less positive about the connection technology fosters *between students* (U.S. 53%, Canada 58%, other countries 56%) and about the connection it fosters *with their instructors* (U.S. 61%, Canada 63%, other countries 51%; Figure 22). The biggest change, although still relatively small, from 2012 to 2013 was in students' (i.e., U.S.-based students) attitudes about using technology to connect with one another; this decreased from 58% to 53% agreement. Though anecdotal experiences suggest that students are more connected than ever via technology, these survey data indicate that digitally enabled or networked connections between individuals may not directly translate into students' *feeling* more connected. Technology is central to the connected age,[29] and understanding that all forms of connectedness are not equal in terms of engaging students in the learning environment is an important lesson. On a side note, however, there was a strong positive correlation (r =0.63) between students who agree that technology makes them feel more connected to what's going on at the college/university and students who agree that technology better prepares them for future educational plans.

> "Though anecdotal experiences suggest that students are more connected than ever via technology, these survey data indicate that digitally enabled or networked connections between individuals may not directly translate into students' *feeling* more connected."

What Factors Are Important When Considering Technology and Students' Connectedness?

The underlying dimensions of students' responses to technology in their academic lives appear to focus on connectedness, involvement, agency, and preparedness. Connectedness involves relationships with peers, instructors, and the institution. Involvement interacts with preparedness when students use technologies that have potential benefits for school and the workplace. Agency relates to motivation, management skills, and self-confidence.
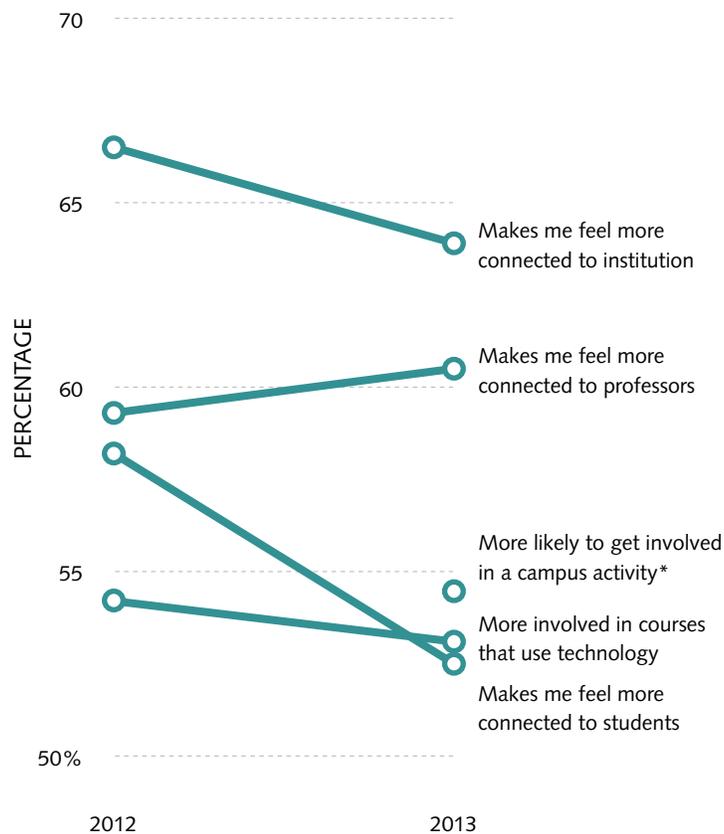
*No data for 2012

Figure 22. Technology and Student Engagement

Age matters when it comes to students' using technology to connect with their professors and their institution in general: older students agree at higher rates than younger students that technology aids such connections. However, age doesn't really matter when it comes to connecting with fellow students. Gender matters where connection with professors is concerned: more female students than male students agree that technology helps them feel more connected with their professors. Female students and younger students reported at higher rates than male students and older students that they are more inclined to get involved in a campus activity when made aware of it through technology. The opposite is true for students' getting more involved in their coursework when technology is used, with males and older students agreeing about more involvement at higher rates than female and younger students.

Students prefer to keep their social and academic lives separate, and they maintain those boundaries in their use of technology. Three out of five U.S.-based students prefer to keep their academic and social lives separate (U.S. 60%, Canada 57%, and other countries 47%). With regard to demographic differences, the most pronounced finding is that black (68%) and Hispanic (64%) students prefer academic and social life separation more than students of other ethnicities (≤ 59%). As shown in Figure 23, academic and social life separation is also more important for older students (67%) than for younger students (57%), for female students (62%) than for male students (58%), for part-time students (66%) than for full-time students (59%), and for students taking classes exclusively online (70%) than for students taking courses exclusively face-to-face (58%).

58% 2011
57% 2012
60% 2013
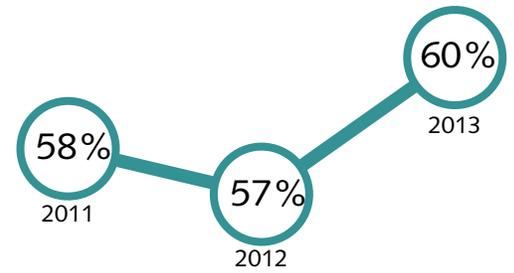
Prefer separate academic and social lives*

*U.S. students only

GENDER

Male   Female
                +4%
58%   62%

AGE

18-24   25 +
                +10%
57%   67%

PT/FT STATUS

Part time Full time
                +7%
59%   66%

OLO / F2F

Online only Face-to-face
                +12%
58%   70%
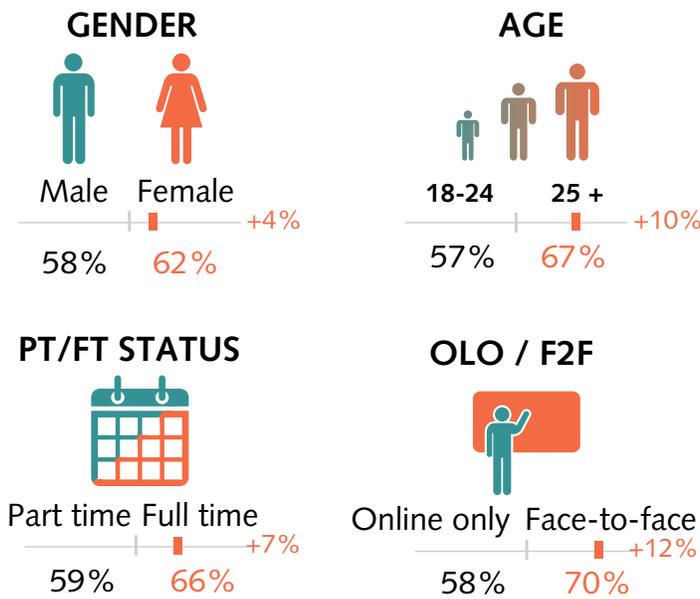
Figure 23. Importance of Keeping Academic and Social Lives Separate, by Demographics

In spite of the nuanced differences in the types of students who more strongly prefer the separation of academic and social lives, it is important not to lose sight of the fact that majorities of U.S.- and Canada-based students, and a near majority of students from other countries, care about their privacy and are interested in managing the overlap of these two worlds (U.S. 60%, Canada 57%, and other countries 47%). In light of this finding, robust personal digital footprints might be a deterrent to using technology to connect for academics, when students clearly prefer to keep their academic and social lives separate. In circling back to the earlier survey finding that technology has its limitations in helping students feel connected to each other and to their professors, we should consider (or reconsider) the ways in which students can use technology for academics while keeping their academic and social lives separate. It also helps explain the next finding about students' lukewarm attitude toward learner analytics. Both of these findings are evidence that students are trying to exert control over how their information is used; control over personal information is a basic privacy tenet. Students' interest in privacy could trump opportunities to digitally connect with others.

Students are only moderately interested in early-alert learner analytics and guidance about course offerings. According to a recent ECAR study on the state of analytics in higher education, nearly seven out of ten institutions (69%) currently view analytics as a major priority, and the importance of analytics in higher education is growing exponentially.[30] The potential academic benefits, such as helping students to learn more effectively or to graduate on time, are clearly covered in the ECAR analytics report, yet the 2013 student study found that students' interest levels in the application of learner analytics were lukewarm (Figure 24). When specifically asked about their interest in having their institution provide guidance about course offerings, such as "you may also like" or "we recommend" suggestions, only about one out of three students responded that they were very/extremely interested (U.S. 33%, Canada 29%, other countries 28%). With regard to students' interest level in having their institution use information about them to alert them to new or different academic resources (e.g., tutoring, skills-building opportunities, etc.), about two out of five students said they were very/extremely interested (U.S. 40%, Canada 36%, other countries 41%). Institutional use of analytics is still rather limited (fewer than 10% of institutions regularly collect system-generated behavior data needed for analytics),[31] and students' lukewarm responses to the concept are likely related to their lack of experience with it. We would expect more positive responses to follow in future years as students become familiar with it and are given the opportunity to recognize how its potential value applies directly to them.

> "We should consider (or reconsider) the ways in which students can use technology for academics while keeping their academic and social lives separate."
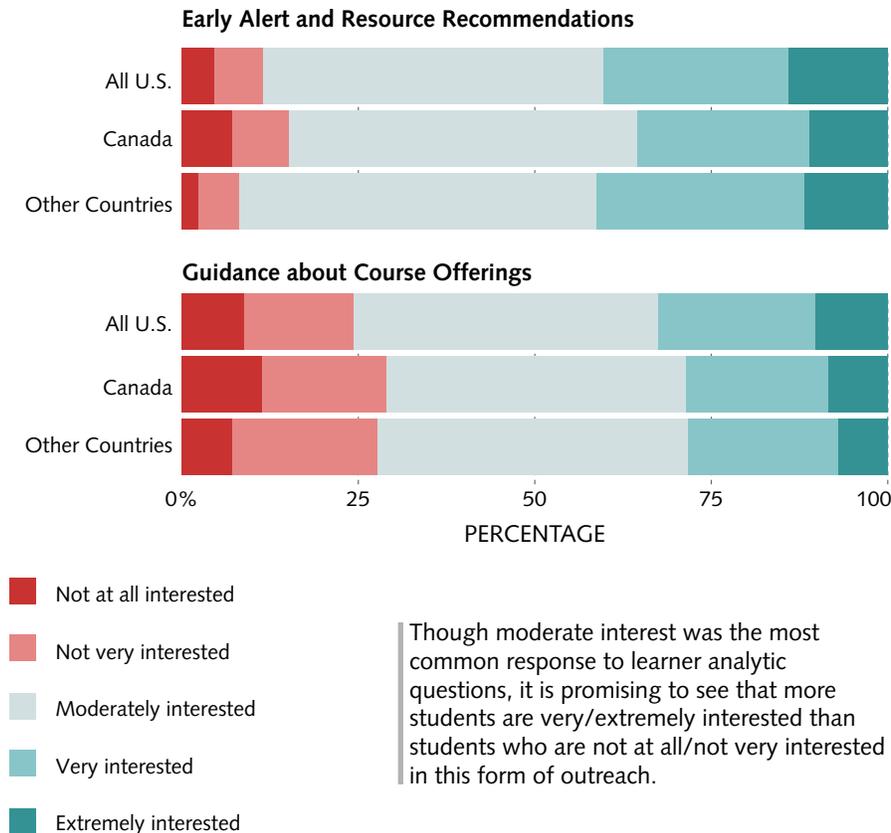
Figure 24. Students' Level of Interest in Learner Analytics

According to the *NMC Horizon Report: 2013,* learning analytics is on the midterm horizon, with widespread adoption being two to three years from now.[32] Many institutions are laying the groundwork for student-facing analytic applications now. Approaching learner analytics thoughtfully and purposefully is imperative, given that many students lack confidence in the process of using information that institutions collect about them to inform their academic decisions; are concerned about privacy issues; and—based on principle—are somewhat resistant to this sort of assistance because they want to become self-sufficient decision makers. Adhering to information privacy principles by collecting data for a stated and transparent purpose may help build students' confidence in learner analytic activities. Communicating applications of learner analytics to students in innovative ways so that outreach is personalized and students don't view the assistance as impersonal digitized profiling could go a long way in gaining students' trust in learner analytics.

Students prefer face-to-face interactions, e-mail, and the CMS as ways to communicate more with their instructors. For the second year in a row, these technologies topped students' wish list for the ways in which they want to communicate more with instructors (Face-to-face: U.S. 68%, Canada 70%, and

other countries 64%; e-mail: U.S. 66%, Canada 70%, other countries 62%; CMS: U.S. 60%, Canada 64%, other countries 60%; see Figure 25). ECAR focus group research found that students are not shy about acknowledging the value of personal face-to-face interactions with their instructors; this is true for formal instruction as well as with casual interaction. Students also divulged that access to their instructors is one of the things they expect as part of what they see as the privilege of being a student. However, when it comes to social media outlets, students' responses complement the earlier finding that they want to keep their social and academic lives separate; few students said that they want their instructors to use Twitter, Facebook, and other social networking sites more (e.g., Cramster, CourseHero, GradeGuru, etc.).

It is no surprise that students favor face-to-face interactions, e-mail, and the CMS as ways to communicate more with their instructors, because this trio provides a comprehensive set of interaction opportunities. Face-to-face communication allows for interpersonal connections and the opportunity to build social capital. E-mail is a passive, asynchronous form of communication that provides an avenue for documenting strings of conversations and serves as a convenient, on-my-own-time question/response system. And the CMS provides a formally structured platform with a variety of interaction opportunities designed by instructors as part of the pedagogical process.
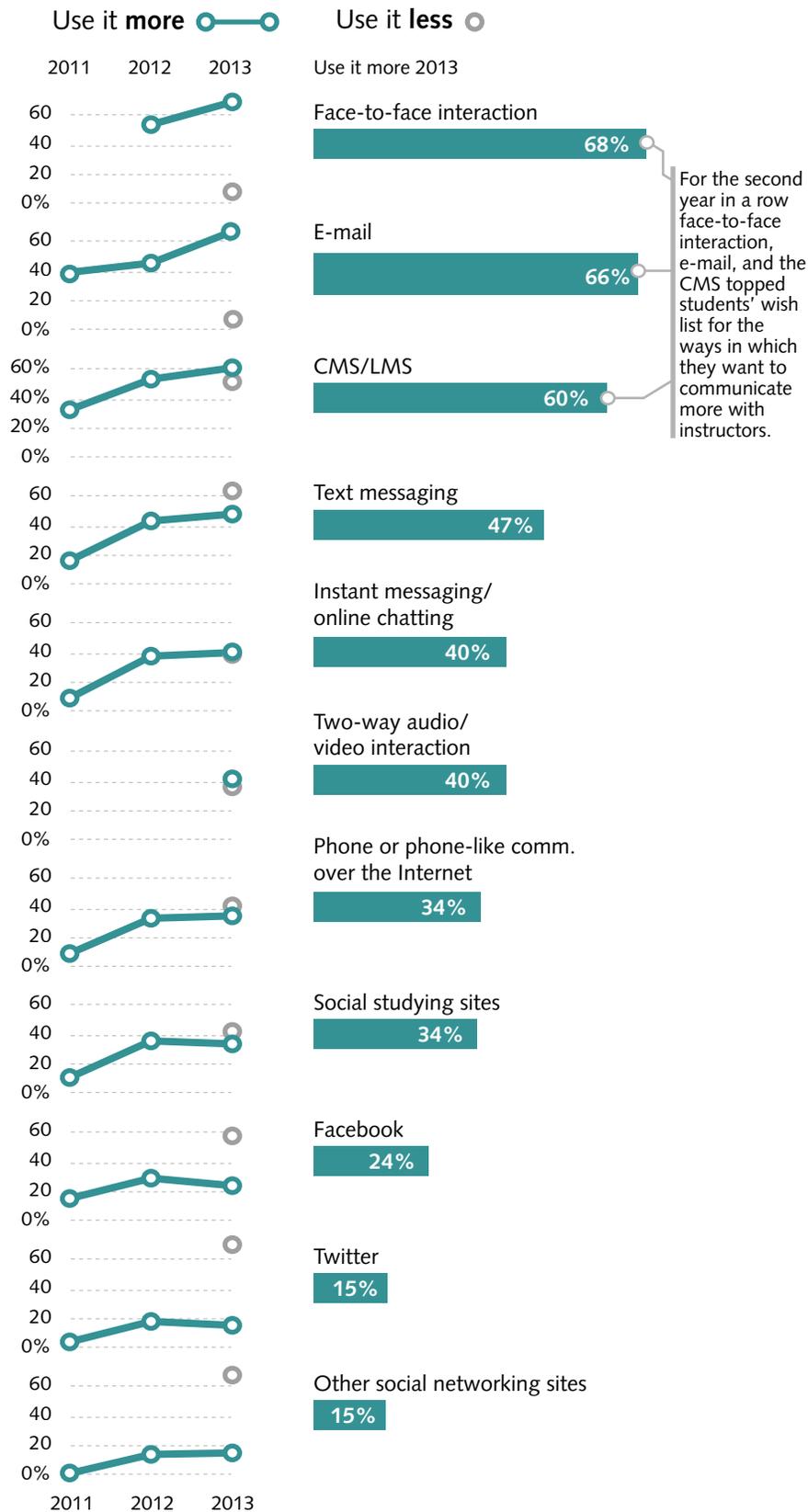
Figure 25. Forms of Communication Students Want Used More (or Less)

Conclusion

The findings from the *ECAR Study of Undergraduate Students and Information Technology, 2013* tell us what technologies students use and how they perceive technology at their institutions.

Some findings have remained consistent since last investigated:

- Attitudes about technology in higher education and instructors' use of technology are positive.
- Students continue to prefer keeping academic and social lives separate.
- Use of various IT tools and resources (e.g., library, CMS, e-books) is about the same this year as last year.
- Students continue to say they prefer and learn the most in courses with some online and some face-to-face components.
- Use of institutionally provided services, applications, and websites (SAWs) is typically up.
- Desktop computer ownership is still strong, but this year we found that students use institutionally provisioned desktops mostly to access on-campus printing and library services.

Some changes and new findings were predictable based on historic trending patterns:

- As students become more adept at using technology from their personal lives in their academic lives, smaller percentages (across Carnegie classes and regions) report that it is very/extremely important to be better trained or skilled at using the available technology to learn, study, or complete coursework. Related to this, but not predicted, is that students say they prefer additional tech training to come from their instructors, designed like a traditional course and offered face-to-face.
- Students are very interested in instructors' integrating the use of their (students') personal mobile devices into their coursework.
- More students took an online course in 2013 than in 2012.
- Few undergrads said they would use a digital badge in an employment application portfolio.
- Compared to other devices, smartphone and tablet ownership saw the greatest growth from 2012 to 2013; smartphones and tablets also had the greatest growth in "importance to academic success."
- Students typically own at least two Internet-capable devices.
- Students said they would use their smartphones as in-class learning tools to look up or photograph information, but inadequate battery life, slow network connections, and device usability issues (small screen/keyboard) are significant obstacles.

And a few findings were *surprising:*

- Ratings of the importance for IT tools and resources (e.g., library, CMS, e-books) and of institutionally provided services, applications, and websites are waning in nearly all cases.

- Students expressed only moderate interest in learner analytics.

- Even more students in 2013 than in 2012 said face-to-face interaction, e-mail, and the CMS are ways in which they want their instructors to communicate *more*. Social media outlets topped the "use it less" list.

- Thirty-nine percent of students taking exclusively online classes want more face-to-face interaction with their instructors.

- Despite the nearly universal deployment of CMSs, two in three students said they want their instructors to use these systems more. This indicates a disconnect between what instructors have access to and what they fully use. Perhaps this indicates a disconnect between selected modality (online only) and desired modality (face-to-face).

- In investigating the magnitude of use of open educational resources, e-texts, simulations and games, and e-portfolios, we found that these are experimental experiences for most students; they typically have used them in one class or on occasion rather than as part of their education resource ecosystem. We also found that students are not telling us they want these resources used more—in fact, interest is either flat or decreasing.

- Banning/discouraging the use of laptops, tablets, and smartphones in class is not uncommon.

- Though the following findings were arguably predictable, given that the survey population for this study consists of undergraduate students who are currently matriculated at a college or university, the extent to which undergraduates take (or don't take) MOOCs and their user experiences prior to this study were largely unknown. For this this reason, these statements about MOOC-related experiences are categorized as "surprising."

  - Only one in four students have heard of a MOOC, and very few (<5%) have taken one.

  - MOOC completion rates for undergraduate students are higher than what is generally reported for MOOC-takers in general.

  - MOOC-taker profiles don't match profiles of students taking traditional/ other types of online courses.

Recommendations

Students' relationship with technology is complex. They recognize the value of technology but nevertheless need guidance when it comes to better using it for academics.

1. Provide students with practical, hands-on technology experiences that smoothly transition from academia to the workplace; this includes seeking opportunities to better understand employers' expectations of students' preparedness to use technology "on the job."

2. Students expect their instructors—not others—to train them to effectively use the technology required for coursework (e.g., use of the CMS, hardware, and software—including specialty software and common productivity software). Instructors need support, encouragement, and possibly incentives to do so.

3. Continue efforts to improve students' "end user" experiences with institutionally provided technology resources such as the CMS and institutional websites; these student-facing services are used by nearly all students and are an opportunity for an institution to make a strong positive impression about the priority it places on technology.

4. Work proactively with academic leaders in seeking opportunities to provide students with opportunities to experience institutionally supported resources such as freely available course content, e-books, simulations and educational games, and e-portfolios.

5. Consider the options at your college/university for meeting students' expectations for uniform experiences with the CMS from course to course and from professor to professor.

Students prefer blended learning environments while beginning to experiment with MOOCs.

1. Students see the value in having mixed modality options. Meet their expectations by providing opportunities for blended learning experiences; these are the types of courses they say they learn the most in.

2. Consider the place of your current students in your MOOC strategy and/or develop a MOOC strategy that considers how MOOCs can supplement rather than supplant your students' learning experiences.

3. Educate your students about MOOCs; most students are unaware of them. Institutions have a fleeting opportunity to contextualize MOOCs for students in a way that will mesh with the institution's own MOOC strategy.

4. Digital badges are still novel, and institutions should seize this opportunity to determine the role of badges and to proactively manufacture the culture they want regarding digital badges and competency-based learning credentialing.

Students are ready to use their mobile devices more for academics, and they look to institutions and instructors for opportunities and encouragement to do so.

1. Provide instructors with systems, support, and encouragement to put course materials online in the interest of extending "classroom walls" and meeting students' expectations to have anytime, anywhere access to course contents.

2. Create (or update) a strategy for incorporating mobile device use into the classroom. Address the IT infrastructure barriers (by providing convenient charging outlets and/or charging stations and more or better network access) that keep students from using their devices effectively while on campus.

3. Educate the campus community about the ways in which students say they would use their smartphones as an in-class learning tool (e.g., sourcing information on demand, photographing information, recording their professors, and spontaneously collaborating or participating in course-related activities).

4. Plan for the continued growth of students' use of Internet-capable devices on campus. Provide infrastructure that is robust enough to comfortably handle current demand for network access while maintaining the agility to easily adapt and grow as needed.

5. Assess students' mobile device experiences with institutionally provided/supported services, applications, and websites to better understand how to prioritize improving services/access for students.

Students value their privacy, and using technology to connect with them has its limits.

1. Respect students' boundaries for privacy by being aware that technology has its limitations for engaging students and making them feel connected to the institution, to their professors, and to other students.

2. Approach learner analytics purposefully and thoughtfully by adhering to information privacy principles. Collect data for a stated and transparent purpose in order to build students' confidence in learner analytics activities.

3. Communicate beneficial applications of learner analytics to students in innovative ways so that it "feels" like personalized outreach and not impersonal digitized profiling.

4. Don't underestimate the value students place on face-to-face time with instructors. Technology can and should be used to connect students with their instructors, but it should not supplant opportunities for face-to-face human interaction or digital proxies for connectedness that human interaction cultivates.

Methodology

Since 2004, ECAR has conducted an annual study of undergraduate students and information technology to shed light on how information technology affects the college/university experience. These studies have relied on students recruited from the enrollment of institutions that volunteer to participate in the project. After securing local approval to participate in the 2013 study (e.g., successfully navigating the IRB process) and submitting sampling plan information, ECAR shared the link to the current year's survey with each participating institution. An institutional representative then sent the survey link to students in the institution's sample. Data were collected between February 18 and April 12, 2013, and 113,035 students from 251 institutional sites responded to the survey (see Table 1). ECAR issued $50 or $100 Amazon.com gift cards to 39 randomly selected student respondents who opted into a drawing—the opportunity drawing was offered as an incentive to participate in the survey. In exchange for distributing the ECAR-deployed survey to their undergraduate student population, participating colleges and universities received files containing anonymous, unitary-level (raw) data of their students' responses along with summary tables that compared their students' aggregated responses with those of students at similar types of institutions. Participation in this annual survey is free, and any higher education institution can sign up to contribute data to this project by e-mailing study@educause.edu.

Countries with participating institutions:

Country	
U.S.	221
Canada	9
Trinidad and Tobago	6
Hong Kong	3
Australia	2
South Africa	2
Finland	1
France	1
Greece	1
Ireland	1
Italy	1
Kuwait	1
Kyrgyzstan	1
Mexico	1
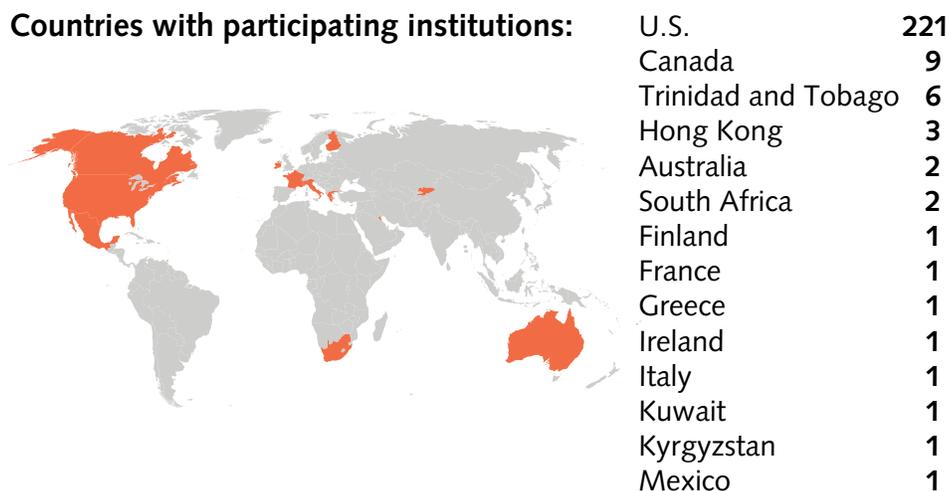
Figure 26. Countries Represented in the Student Study, 2013

Table 1. Summary of Institutional Participants and Response Rates

Carnegie Class/Region	Institutional Implementation Sites Count	Percentage of Overall Responses Collected	Total Response Count	Overall Response Rates
AA	44	16%	18,148	6%
BA Public	15	3%	3,423	6%
BA Private	18	4%	4,657	19%
MA Public	47	26%	28,940	8%
MA Private	30	7%	7,994	9%
DR Public	48	26%	29,262	6%
DR Private	19	7%	8,332	9%
Canadian	9	3%	2,934	3%
Other Countries	21	8%	9,345	9%
All	251	100%	113,035*	7%

* Data from one institution were excluded from the final analysis, yielding 112,585 valid responses for the full 2013 data set.

The quantitative findings in this report were developed using a representative sample of students from 220 U.S.-based higher education college and university sites.[33] A stratified random sample of approximately 10,000 respondents was drawn from the overall response pool to proportionately match a profile of current U.S. undergraduates. This sample was based on IPEDS data on age, gender, ethnicity, full-time/part-time status, Carnegie class, and institutional control (public/private) for U.S. undergraduates. (A similar methodology was used for the 2012 sample.) The 2013 representative U.S. sample results in an approximate 1% margin of error for percentages estimated for the whole population. Margins of error are higher for subsets of the population. The international respondents were neither sampled nor weighted, but comparison data from Canada and other countries are included in the report to highlight differences and similarities between U.S. and non-U.S. results (see participant list in the appendix). Findings from past ECAR studies were also included, where applicable, to characterize longitudinal trends. All findings in this report refer to the U.S. representative sample unless otherwise noted. All findings are statistically significant at the <0.001 level unless otherwise noted.

ECAR conducted four student focus groups between April 30 and May 2, 2013, to investigate the deeper meaning of this year's survey findings. All of the focus groups were held at one site (an MA public institution that participated in the 2013 survey), and the results are not representative of the greater undergraduate student population. The findings were summarized into broad thematic messages, paired with survey results, and used as appropriate to interpret or add comments to quantitative survey findings.

Acknowledgments

Appendix: Participating College/University Sites

Aalto University*
Adams State University
Adventist University of Health Sciences
Alpena Community College
American College of Greece-Deree College*
American University of Central Asia*
American University of Kuwait*
American University of Paris*
American University of Rome*
Antelope Valley College
Appalachian State University
Auburn University
Baldwin Wallace University
Baylor University
Bellevue University
Benedictine University
Boise State University
Brazosport College
Bridgewater State University
Brown University
Bucks County Community College
Butler University
California Lutheran University
California Polytechnic State University, San Luis Obispo
California State Polytechnic University, Pomona
California State University, Channel Islands
California State University, Chico
California State University, Dominguez Hills
California State University, East Bay
California State University, Fresno
California State University, Fullerton
California State University, Long Beach
California State University, Los Angeles
California State University, Monterey Bay
California State University, Northridge
California State University, Sacramento
Catawba College
Cecil College
Central Michigan University
Chadron State College
Chandler-Gilbert Community College
City University of Hong Kong*
Clackamas Community College
Clark University
Clemson University
College of DuPage
College of Mount Saint Joseph

College of Saint Benedict/Saint John's University
Collin College
Colorado Mountain College
Contra Costa College
Coppin State University
County College of Morris
Covenant College
De Anza College
DePauw University
DeVry University–Online
DeVry University–Onsite
Diablo Valley College
Douglas College*
Drexel University
Durham College*
Eastern Kentucky University
Elon University
Embry-Riddle Aeronautical University
Embry-Riddle Aeronautical University–Prescott Campus
Embry-Riddle Aeronautical University–Worldwide
Emory University
Estrella Mountain Community College
Fairfield University
Fleming College*
Foothill College
Fordham University
Fort Hays State University
Franklin W. Olin College of Engineering
Furman University
Gallaudet University
Geneva College
Georgetown College
Georgia Southern University
Georgia State University
Grand Canyon University
Grand Rapids Community College
Greenville Technical College
Hamilton College
Harvard College
Harvey Mudd College
Heidelberg University
Hollins University
Hong Kong Polytechnic University*
Humber College Institute of Technology & Advanced Learning*
Humboldt State University

Participating College/University Sites, *continued*

Illinois Central College
Indiana University Bloomington
Indiana University–Purdue University Indianapolis
John Wood Community College
Johns Hopkins University
Joliet Junior College
Juniata College
Keene State College
Kent State University
Lawrence Technological University
Lethbridge College*
LeTourneau University
Long Beach City College
Los Medanos College
Louisiana State University
Loyalist College*
Loyola University Chicago
Manhattan College
Marietta College
McGill University*
Medgar Evers College/CUNY
Menlo College
Mesa Community College
Messiah College
Metropolitan State University of Denver
Michigan State University
Mississippi State University
Moraine Valley Community College
North Carolina A&T State University
Northampton Community College
Northern Michigan University
Northland International University
NorthWest Arkansas Community College
Northwestern University
Ohio State University
Oklahoma State University Institute of Technology
Old Dominion University
Paradise Valley Community College
Parkland College
Pennsylvania College of Technology
Pennsylvania State University
Pepperdine University
Philadelphia University
Phoenix College
Pima County Community College District
Polk State College
Portland State University

Purdue University
Queensland University of Technology*
Ramapo College of New Jersey
Red River College*
Rio Salado College
Riverside City College
Robert Morris University
Saint Michael's College
Salt Lake Community College
San Diego State University
San Francisco State University
San Jose State University
Sauk Valley Community College
Scottsdale Community College
Seneca College of Applied Arts and Technology*
Seton Hall University
Shasta College
Shenandoah University
South Dakota State University
South Mountain Community College
Southern Illinois University Edwardsville
Southern Methodist University
St. Norbert College
Stony Brook University
SUNY College at Plattsburgh
Tarleton State University
Texas Wesleyan University
Thomas College
Truman State University
Tulane University
Universidad Anahuac Mayab*
University College Dublin*
University of Alabama in Huntsville
University of Alaska Fairbanks
University of Arizona
University of Arkansas
University of California, Berkeley
University of Cape Town*
University of Central Florida
University of Central Oklahoma
University of Chicago
University of Cincinnati
University of Delaware
University of Denver
University of Florida
University of Georgia
University of Hong Kong*
University of La Verne

Participating College/University Sites, *continued*

University of Louisville
University of Maine at Presque Isle
University of Maryland
University of Maryland, Baltimore County
University of Massachusetts Dartmouth
University of Memphis
University of Michigan–Ann Arbor
University of Mississippi
University of Missouri
University of Nebraska Medical Center–
   College of Nursing–Kearney Campus
University of Nebraska Medical Center–
   College of Nursing–Lincoln Campus
University of Nebraska Medical Center–
   College of Nursing–Norfolk Campus
University of Nebraska Medical Center–
   College of Nursing–Omaha Campus
University of Nebraska Medical Center–
   College of Nursing–Scottsbluff Campus
University of Nevada, Las Vegas
University of Nevada, Reno
University of New Hampshire
University of New Mexico
University of North Carolina at Pembroke
University of North Texas at Dallas
University of Northern Iowa
University of Notre Dame
University of Oregon
University of Pretoria*
University of Scranton
University of South Alabama
University of South Carolina Upstate
University of South Dakota
University of South Florida
University of Texas at Brownsville
University of Texas–Pan American
University of the Incarnate Word
University of Trinidad and Tobago–Education
   and Sport Studies at Corinth*

University of Trinidad and Tobago–
   Education Campus at Valsayn*
University of Trinidad and Tobago–Energy
   Institute at Point Lisas*
University of Trinidad and Tobago–
   Engineering and Manufacturing Campus
   at San Fernando*
University of Trinidad and Tobago–
   O'Meara Campus at Arima*
University of Trinidad and Tobago–The
   Creativity Campus at Port of Spain*
University of Washington
University of West Florida
University of West Georgia
University of Western Australia*
University of Wisconsin–Eau Claire
University of Wisconsin–Madison
University of Wisconsin–Milwaukee
University of Wisconsin–Parkside
University of Wisconsin–Superior
University of Wisconsin–Whitewater
Utah Valley University
Victor Valley College
Virginia Commonwealth University
Viterbo University
Walsh College
Washington and Lee University
Washington University in St. Louis
Wayne State College
Weber State University
West Hills Community College District
West Virginia University
Western Carolina University
William Paterson University of New Jersey
Winona State University
Xavier University
Yavapai College

Non-U.S.-based institutions

Notes

1. B. Means, Y. Toyama, R. Murphy, M. Bakia, and K. Jones, *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* (Washington, DC: Center for Technology in Learning, U.S. Department of Education, 2010), http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf.

2. A stratified random sample of approximately 10,000 respondents was drawn from the overall responses pool of U.S. respondents to proportionately match a profile of current U.S. undergraduates (based on IPEDS demographics and institutional data). See the Methodology section for more about the sampling process and institution details.

3. We also found that interest in being better trained or skilled at using available technology in college yields higher expectations for being adequately prepared to use technology in the workplace.

4. Region p <.001; C-class p <.0013.

5. With regard to length of technology training opportunities, short-term formats received the single-highest response count, but when considering the combined data of design, mode, trainer, and length, full-term training opportunities surpassed short-term ones. This tracks with the theme throughout this report wherein students express interest in more technical training from their instructors as part of their course experiences when it is relevant and necessary.

6. Eden Dahlstrom, with foreword by Charles Dziuban and J.D. Walker, *ECAR Study of Undergraduate Students and Information Technology, 2012,* Research Report (Louisville, CO: EDUCAUSE Center for Applied Research, September 2012), available from http://www .educause.edu/ecar.

7. Games and gamification are on the midterm horizon, according to the *NMC Horizon Report 2013*, indicating that we should continue to ask students about their gaming experiences to track progress toward this prediction.

8. EDUCAUSE Core Data Service, 2012, Module 3, Question 5, http://www.educause.edu/coredata.

9. These results exclude students who indicated "no preference" for learning environments.

10. Younger students (29%) prefer courses with no online components over older students (20%), and conversely older students (23%) prefer courses that are completely online over younger students (6%).

11. L. Johnson, S. Adams Becker, M. Cummins, V. Estrada, A. Freeman, and H. Ludgate, *NMC Horizon Report: 2013 Higher Education Edition* (Austin, TX: The New Media Consortium, 2013), http://www.nmc.org/pdf/2013-horizon-report-HE.pdf.

12. Widespread adoption in this context means that the majority of undergraduates have taken a MOOC.

13. Everett M. Rogers, *Diffusion of Innovations*, 5th ed. (New York: Free Press, 2003).

14. Tamar Lewin, "Coursera, an Online Education Company, Raises Another $43 Million," *New York Times*, July 10, 2013: "The year-old company offering free online courses has raised another $43 million in venture capital from investors active in both domestic and international education," http://bits.blogs.nytimes.com/2013/07/10/ coursera-an-online-education-company-raises-another-43-million/.

15. Denominator excludes N/A answers, yielding results that represent students who have an opinion about credential documentation.

16. EDUCAUSE Core Data Service, 2013, Module 3, Question 2 and 4.

17. Ibid.

18. EDUCAUSE Core Data Service, 2012, Module 3, Question 5, http://www.educause.edu/coredata.

19. Percentages are the sum of responses for ownership of four, five, or six-plus devices.

20. Joanna Brenner, "Pew Internet: Mobile," June 6, 2013, http://pewinternet.org/Commentary/2012/February/Pew-Internet-Mobile.aspx.

21. Projection based on the additive value of current ownership and percentage of students indicating that they didn't currently own the type of device but planned to purchase one in the next year.

22. L. Johnson et al., *NMC Horizon Report*.

23. ECAR focus groups with students.

24. For this question, about one in five students said that smartphones were not an effective learning tool.

25. Findings apply to all students, not just to students who think a smartphone is an effective learning tool.

26. Accessing library website (p =0.021), registering for courses (p <0.001), accessing financial aid information (p =0.003), and ordering transcripts (p =0.002) via a mobile device were up. There was no significant difference for accessing grades, and accessing the CMS from a mobile device was actually down from 2012 to 2013 (p <0.001).

27. Accessing grades (p =0.001), registering for courses (p <0.001), ordering transcripts (p <0.001), accessing the CMS (p <0.001), and accessing financial aid information (p =0.007) were all rated good/excellent by significantly fewer students in 2013 than in 2012, while ratings differences for accessing library resources were not statistically significant.

28. Jacqueline Bichsel, *Mobile IT in Higher Education, 2013,* Research Report; forthcoming (Louisville, CO: EDUCAUSE Center for Analysis and Research), available from http://www.educause.edu.

29. Diana Oblinger, "Higher Education in the Connected Age," *EDUCAUSE Review* 48, no. 2 (March/April 2013), http://www.educause.edu/ero/article/higher-education-connected-age.

30. Jacqueline Bichsel, *Analytics in Higher Education: Benefits, Barriers, Progress, and Recommendations*, Research Report (Louisville, CO: EDUCAUSE Center for Applied Research, August 2012), available from http://www.educause.edu/ecar/.

31. Ibid.

32. L. Johnson et al., *NMC Horizon Report*.

33. The survey was implemented by 221 U.S.-based institutions. One U.S.-based site was omitted from the final data set to accommodate localized circumstances related to an IRB request. Twenty-four non–U.S.-based institutions implemented the survey in 2013.