



ECAR Study of Undergraduate Students and Information Technology, 2015

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Foreword

We all know that higher education is experiencing a good deal of pressure and that this pressure is particularly forceful in the domain of teaching and learning. Responding to these pressures in a creative and productive way requires a strategic (and perhaps even transformative) orientation, but one that gains its footing on evidence.

Nothing helps us quite so much as a reality check, aka the arrival of evidence. And longitudinal evidence, which enables us to spot developments, patterns, shifts, and trajectories, is more useful still. This is what this study, together with the student studies from past years, provides us—solid information about the key constituent for the postsecondary educational mission: the learner.

As in past years, this current ECAR student study provides some extremely useful, evidence-based “trail markers” that can assist us as we explore the changing teaching and learning landscape. Here are just a few:

- The evolution of the digital divide, away from simple device ownership (with many students owning multiple devices) and toward the challenges of fully integrating these digital resources into the curriculum. This is most clearly evident with respect to the integration of mobile technology into the curriculum, which is still a nut that higher education needs to crack.
- The student desire, clear this year as it has been for the recent years, for mentoring or face-to-face experiences with faculty, with a clear majority in favor of a balance between online and face-to-face work.
- Student interest in the use of analytics and early-alert systems, and a favorable disposition to having their data used for that purpose.
- Evidence of sustained student interest in web-based course resources and materials that are not textbooks (e.g., recorded lectures).

With this study, ECAR and its partner institutions, the ones who participated in the study, have done us a great service. These studies afford us the opportunity to weave evidence into our strategic thinking, thereby leveraging our efforts to move ahead.

—*Malcolm Brown, Director, EDUCAUSE Learning Initiative*

Executive Summary

Since 2004, ECAR has partnered with higher education institutions to investigate the technologies that matter most to undergraduate students. We do this by exploring students' technology experiences and expectations. In 2015, the ECAR technology survey was sent to approximately 970,000 students at 161 institutions, yielding 50,274 responses across 11 countries and 43 U.S. states. This year's findings are based on a stratified random sample of 10,000 U.S. respondents and shed light on a number of topics:

- **Technology Experiences:** Technology is embedded into students' lives, and students generally have positive inclinations toward technology. Technology has a moderate influence on students' active involvement in classes; a smaller percentage of today's undergraduates say they get more actively involved in courses that use technology than students from a few years ago.
- **Technology Ownership and the Campus Environment:** Students own more Internet-capable devices than ever. Residential students generally report that campus network performance is lower than is reported by students who live off campus, and, overall, students' experiences with campus Wi-Fi are disappointing. Networking managers will have to continue to expand capacity to keep up with a projected increase in connected devices and expectations for frictionless and ubiquitous access to Wi-Fi.
- **Mobile Devices and Student Learning:** Students and faculty have similarly high levels of interest in using mobile devices to enhance learning, but the actual use of these devices in academics remains low, despite their increased prevalence.
- **Technology Resources and Tools:** Although students use technology extensively, we have evidence that technologies are not achieving their full potential for academic use. Meaningful and intuitive use of technology for academics cannot be assumed, even when a technology is widely available or used in other contexts.
- **Analytics and Data Privacy:** Most students support institutional use of their data to advise them on academic progress in courses and programs. Much of the analytics functionality students seek already exists in commercial digital learning environments.
- **New Models for Education:** New models for education, such as MOOCs and competency-based credentials, haven't yet translated to behavioral or attitudinal changes for undergraduates. The majority of students say they learn best with a blend of online and face-to-face work.

As found in past ECAR studies on students and technology, leveraging

technology as a tool to engage students in meaningful ways and to enhance learning is still more of a promise than a practice. Students generally have positive inclinations toward technology, and most say they were prepared to use technology when they entered college. Yet technology hasn't found a mainstream spot in teaching and learning, at least not a spot where students use technology to get actively involved in their coursework. Helping faculty incorporate strategic, pedagogically sound uses of technology into their teaching practice can facilitate a sense of student connectedness and engagement. According to ECAR research on faculty uses of and experiences with technology, faculty are generally interested in incorporating more technology into their teaching practices. This is especially true when they see evidence that the technology can improve student outcomes. Optimizing the impact of IT in academics will take thoughtful leadership to help bridge the gaps between student experiences with technology inside the classroom and their experiences outside the classroom.

Key Findings

Technology Experiences

- Technology is embedded into students' lives, and students generally have positive inclinations toward technology. Technology has a moderate influence on students' active involvement in classes; a smaller percentage of today's undergraduates say they get more actively involved in courses that use technology than students from the 2012 study.
- Most students were prepared to use technology when they entered college. Today's undergraduates feel no more (or less) prepared to use technology in higher education than their counterparts from a few years ago.

Technology Ownership and the Campus Environment

- More students own Internet-capable devices now than ever. A projected increase in connected devices could soon challenge even the best-provisioned networks.

Mobile Devices and Student Learning

- Students and faculty have similarly high levels of interest in using mobile devices to enhance learning, but the actual use of these devices in academics remains low, despite their increased prevalence.

Technology Resources and Tools

- Although students use technology extensively, we have evidence that technologies are not achieving their full potential for academic use. Meaningful and intuitive use of technology for academics cannot be assumed, even when a technology is widely available or used by students in other contexts.

Analytics and Data Privacy

- Most students support institutional use of their data to advise them on academic progress in courses and programs. Much of the analytics functionality students seek already exists in commercial digital learning environments.

New Models for Education

- New models for education, such as MOOCs and competency-based credentials, haven't yet translated to behavioral or attitudinal changes for undergraduates. The majority of students say they learn best with a blend of online and face-to-face work.

Background and Introduction

The EDUCAUSE Center for Analysis and Research (ECAR) has conducted research on undergraduate students and IT since 2004. Understanding how students use and value technology is essential to enabling institutions to deliver effective services and make wise IT investments. In the 12th year of this research, 50,274 respondents from 161 institutions in 11 countries and 43 U.S. states participated in the research (figure 1). The overall response rate was 5% of the population surveyed, a rate comparable to that of similar online surveys. The quantitative findings in this report were developed using a representative sample of 10,000 survey responses from students at U.S. institutions. The large number of survey respondents yielded a 1% margin of error and allows us to make generalized statements about the findings.

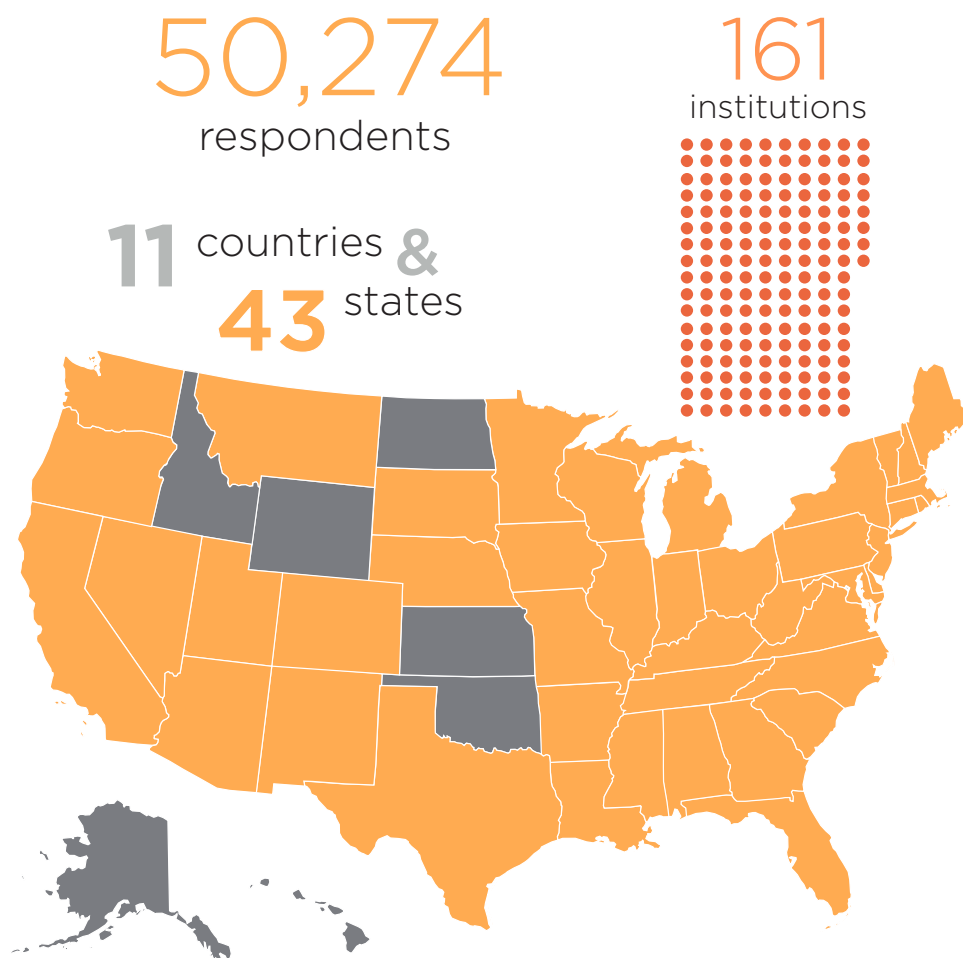


Figure 1. Student study participation overview

The findings in this report include 2015 ECAR student survey results, historic data from past ECAR student surveys, data from the 2015 ECAR faculty study, institutional data from the EDUCAUSE Core Data Service (CDS), and data from relevant scholarly and journalistic literature. The combination of these resources helps contextualize the results and present a broader story of technology experiences in the academic community. This survey tracks general trends of students' technology experiences and expectations. In addition, each year ECAR selects a particular focus area of timely interest. This year's focus is on students' mobile devices and how they use those devices for anytime, anywhere academics, connecting and communicating, and conducting college or university business.

This research project used an online survey to ask students about their experiences with technology. We asked them what devices they own, how they use them, which aspects of technology are important to their academic success, which technologies they would like to see their instructors use more often, and for their opinions of IT services at their colleges and universities. We also measured individual differences in students' inclination toward technology, adding important data that contradict some stereotypes about students and technology.

ECAR also conducted a faculty technology study in 2015. By investigating both student and faculty perspectives about technology, ECAR can convey IT experiences in higher education from two vantage points. The faculty companion project used a methodology similar to that of the student study to collect data about faculty's IT experiences and expectations. Side-by-side results are offered for the most compelling findings, and a separate report about the faculty study responses is available from the [ECAR website](#).

This longitudinal research on students' IT experiences and expectations can catalyze conversations among IT professionals and institutional leadership about how to better serve their constituents. Students' perspectives can help institutions enhance decision making to:

- Improve IT services
- Increase technology-enabled productivity and efficiency
- Prioritize strategic IT investments
- Identify and plan for technology shifts among the various constituencies of the academic community
- Become more technologically competitive among peer institutions, and find out what it might take to compete at the next level

Any higher education institution can contribute data to this annual project by contacting study@edUCAUSE.edu. Participating institutions receive the added bonus of a semi-customized peer benchmarking report that compares their students' responses with responses from students at peer institutions.

Findings

This report is organized into six sections designed to be read as stand-alone pieces or as a whole. The former provide quick access to targeted areas of interest, while the latter provides the context to better understand the IT ecosystem in which students live. The report begins with students' general IT experiences and ends with students' expectations for the next generation of learning environments and models for education.

Technology Experiences

Technology is embedded into students' lives, and students generally have positive inclinations toward technology. Technology has a moderate influence on students' active involvement in classes; a smaller percentage of today's undergraduates say they get more actively involved in courses that use technology than students from the 2012 study.

Students' Inclination toward Technology

ECAR asked students to place themselves on a series of 100-point semantic differential scales (see appendix B) related to their IT **disposition** or temperament (e.g., enthusiastic versus reluctant, early versus late adopter, technophile versus technophobe); **attitude** (e.g., satisfied versus dissatisfied, pleased versus perturbed, useful versus useless, enhancement versus distraction); and **usage** patterns (e.g., always versus never connected, central versus peripheral, new versus old media, frequent versus infrequent). Students generally consider themselves to be sophisticated and engaged with IT, averaging significantly above the neutral position (50) on the scales. On average, students reported positive dispositions toward IT (64), positive attitudes toward IT (71), and high levels of IT usage (73); see figure 2. This is the second year we asked about technology disposition, attitude, and usage, and the 2015 scores are almost identical to the 2014 scores (usage was 3 points higher in 2015).

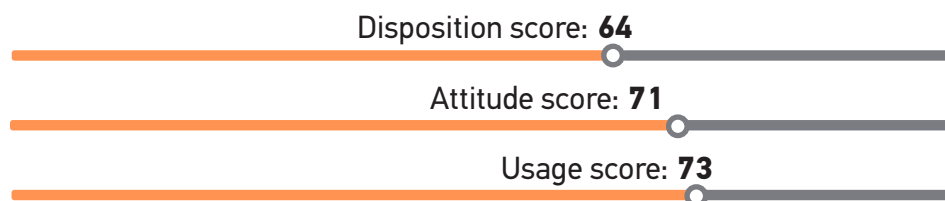


Figure 2. Mean scores of student semantic differential toward technology

Although students do not always display the technology-dependent attributes of the digital native, they remain fairly positive about technology and use it extensively. Conversely, according to the ECAR faculty study, faculty, who are often perceived as being uninterested in technology, have an orientation and usage patterns similar to those of their students. So students are perhaps somewhat less—and faculty somewhat more—positively inclined toward technology than is popularly assumed, which can be useful information for IT leaders.

Preparedness to Use Technology

Most students (67%) said they were prepared to use technology when they entered college. This is roughly the same percentage as in the 2012–14 student study findings. Students with high technology inclination¹ scores had greater confidence than other students in their preparedness to use technology when they started college. There are no meaningful differences by institution type or student demographic characteristics when it comes to general preparedness to use technology upon college entry.

Technology to Connect and Engage Students

There has been little change in the extent to which students say technology helps them connect and engage (figure 3). The National Survey of Student Engagement (NSSE) showed stable findings, with only a slight uptick on its measures of engagement related to technology from 2013 to 2015.² While technology that can connect and engage the user is increasingly embedded in the lives of undergraduates (e.g., mobile devices, communication apps, collaboration tools), today's students don't feel any more connected to their institution (63%), their instructors (51%), or other students (52%) than their counterparts from previous surveys. Just because technology *can* be a bridge to connect and engage students doesn't mean that the bridge itself facilitates meaningful connections, connectedness, or engagement.

Percentage of students who agreed that they wish they were better prepared:

33%

to use basic software and applications

42%

to use institutionally specific technologies such as the LMS

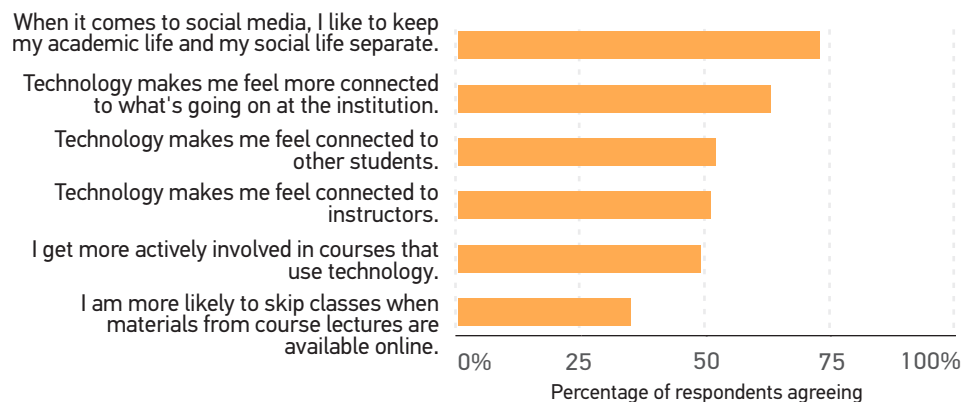


Figure 3. Trends for technology as a means to engage students

It is perhaps less the abundance of technology and more the way it is applied that can help foster connectedness. An Indiana University 2013 study found that “increased use of technology is related to a number of aspects of student engagement” as measured by the NSSE survey instrument.³ The study found that technology plays an important role in students’ day-to-day experiences and is related to “effective educational practices and student outcomes,” and that communicating through technology improves the quality of students’ relationships with faculty, staff, and peers. The 2015 ECAR results also suggest that students who embrace technology are more inclined to value its ability to connect them with other people and their institution. About 7 in 10 students with the highest technology inclination scores agreed that technology makes them feel connected to peers and instructors, compared with only around half of students with low to midrange technology inclination scores.

Using technology to build community among students is tricky business. Technology can be used to both connect with and disconnect from a person’s surroundings. It is only with intent that students will find meaningful ways to connect with fellow students and with their instructors. “The key elements for success are the teachers, school leaders and other decision makers who have the vision, and the ability, to make the connection between students, computers and learning.”⁴ Although this quote refers to K–12 education, the idea applies just as aptly to higher education.

“Models come and go, as do the devices that capture our imagination, but the more important transformation of higher education has to do with our ability to bring people together and broaden the conversation about technology across our colleges and universities.”

—John O’Brien, President and CEO, EDUCAUSE

In-Class Technology Experiences

The extent to which students encounter technology depends largely on the choices faculty make about using technology in their teaching. ECAR research has found that faculty's strongest motivator to integrate technology into their classes is having a clear indication or evidence that students would benefit from its use.⁵ (This applies to faculty in all types of institutions.) Therein lies the challenge—two challenges, actually. The first is that technology changes so quickly and scientific experimentation progresses so slowly that peer-reviewed, publishable results on the use of in-class technology would likely be moot by the time the material is published. The second is that it is incredibly difficult to create experimental designs in an educational setting. The absence of such rigorous evidence may deter faculty from incorporating technology into their classes. Knowing how today's students are able to use technology in other settings (social, retail, banking, and even in their high school classroom), we can easily see a growing disconnect between what students find on many campuses and how they interact with technology in other settings.

Younger matriculating college students arrive with expectations of what technology will be used—and in what ways—in their classes. Many high schoolers (45%) use tablets for school work (at home or in school), and 15% use a tablet daily at school.⁶ Incorporation of technology in higher education is not much more common. About three in five students said that most or all of their instructors use technology during class to support the learning material (59%) or to encourage students to use online collaboration tools (58%); see figure 4. About half (53%) said that most or all of their instructors use technology during class to maintain attention. Only about one-third of students (35%) said that most or all of their instructors encourage them to use their own devices during class to deepen learning. Students do generally have confidence in their instructors' IT skills. The majority of undergraduates said most or all of their instructors have adequate IT skills for carrying out course instruction (67%, down from 72% the previous year).⁷

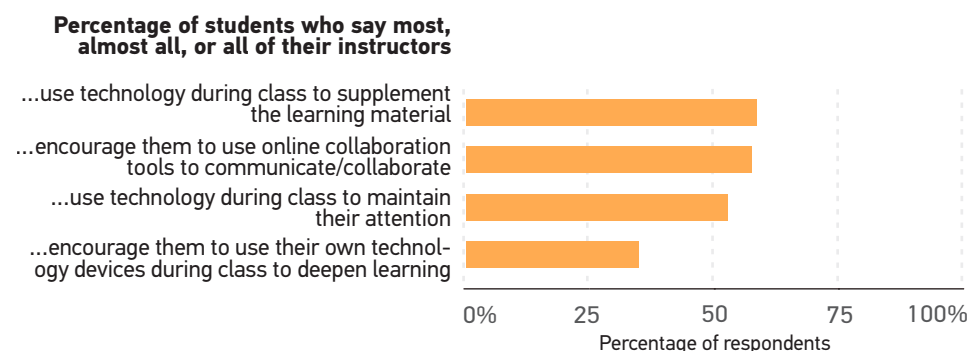


Figure 4. Faculty use of technology as a means to engage students

Students' Technology Ownership and the Campus Environment

Students own more Internet-capable devices than ever. Overall, students' experiences with Wi-Fi are disappointing—only half say campus network performance (e.g., high speed, no interruptions) is good or excellent. Network performance ratings are particularly low among residential students, with only about one in three rating their experiences as good or excellent. Networking managers will have to continue to expand capacity to keep up with a projected increase in connected devices, and expectations for frictionless and ubiquitous access to Wi-Fi.

Device Ownership Trends

ECAR has been tracking students' technology ownership since 2004. In 2015 we hit a milestone: smartphone ownership (92%) exceeded laptop ownership (91%) for the first time (figure 5). The first "smartphone" hit the market in 1993, but global popularity wasn't achieved until 2007, when the first iPhone was released.⁸ The cost of devices has decreased from around \$1,000 to almost free (with a data plan through a cellular service provider). Functionality has evolved from telephone, pager, and PDA to offerings with computing power approaching that of a laptop. While today's students still find laptops more convenient and productive for many activities (see figure 7), this may not be the case for long. The digitally fluent next generation of college students could have a touchscreen mentality and the digital dexterity to use smartphones as their *only* computer.⁹ Because far more undergraduate students own mobile devices (smartphones, laptops, and tablets) than the general adult population, higher education is in a unique position to leverage these devices as productivity tools, as assets for learning, and as administrative or transactional resources.

Laptop market share:

64% Windows

32% Mac

Tablet market share:

50% iOS (iPad)

30% Android

13% Windows

Smartphone market share:

55% iPhone

42% Android

Desktop market share:

81% Windows

14% Mac

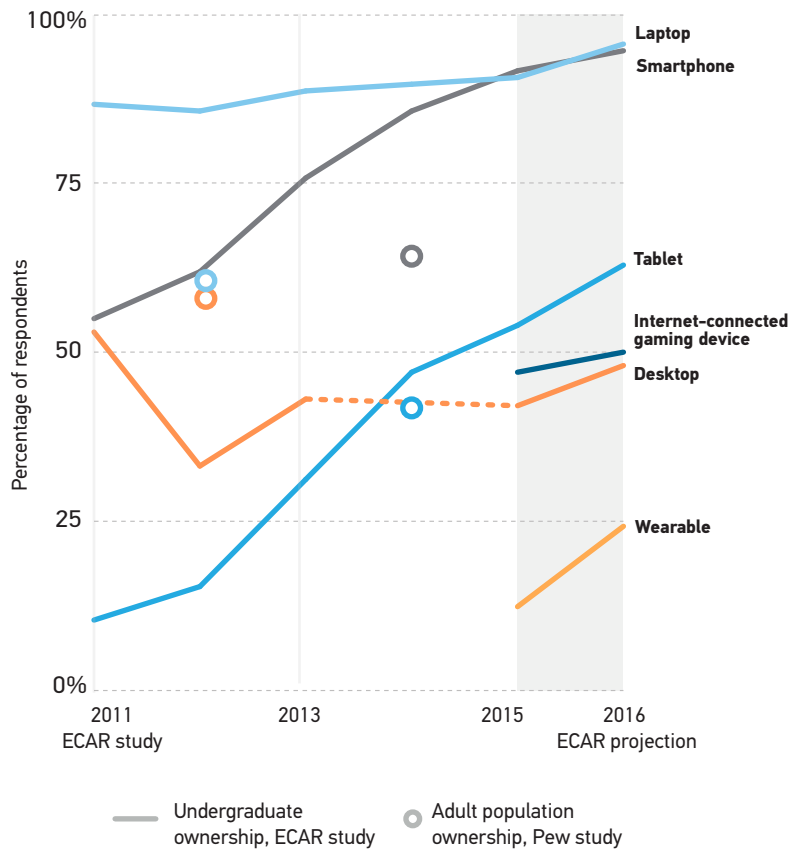


Figure 5. Device ownership history, with 2016 projections¹⁰

Percentage of students
owning Internet-capable
devices:

2%

none

6%

just one

92%

at least two

64%

three or more

31%

four or more

15%

five or more

10%

six or more

Device Ownership Pervasiveness

Single-device ownership is rare (figure 6). Almost half of the undergraduates surveyed (47%) own a laptop, a tablet, *and* a smartphone. The next most popular combination was laptop and smartphone ownership (38%). Just 4% own only a laptop, 3% only a smartphone, and 1% only a tablet. Two percent of all students do not own any of these devices.

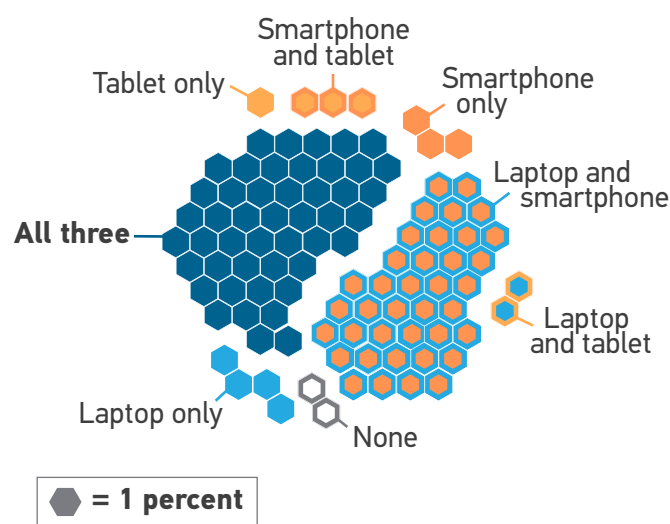


Figure 6. Student laptop, tablet, and smartphone ownership

Percentage of students trying to connect devices to the network *at the same time*:

- 7% none
- 32% just one
- 61% at least two
- 11% three or more

Campus Networks, BYOD, and the Internet of Things

Devices students own extend beyond “traditional” mobile technologies (e.g., smartphones and tablets). The growth of the Internet of Things (IoT)—“the network of physical objects or ‘things’ embedded with electronics, software, sensors, and connectivity to enable objects to collect and exchange data”¹¹—means more devices on campuses than ever. With our scope expanded beyond the big three of mobile devices (smartphone, laptop, tablet), the survey determined that nearly all students (92%) have at least two Internet-capable devices,¹² with two in three students (64%) having at least three. While not all these devices are connected to the network at once, 61% of students said they typically connect at least two devices to the campus network at the same time. Ninety-five percent of institutions have Wi-Fi access in more than half of their classrooms, and 31% have Wi-Fi access that extends to more than half of the open areas of campus.¹³ Although Wi-Fi may be pervasive on some campuses or in some campus locations, only three in five students said they have reliable access to Wi-Fi throughout their campus (58%) or in classrooms/instructional spaces (63%).

For institutions with a residential student population, it will be particularly important to develop IoT governance policies. For example, will there be limits on the number and types of devices that are allowed to connect to the campus network? How will institutions accommodate requests for connecting laptops, smartphones, tablets, wearable fitness devices, smartwatches, smart TVs, gaming devices, smart light bulbs, etc.? But this is a long-standing challenge. As noted in a 2013 ECAR report on IT infrastructure in the “bring your own device” (BYOD) era, “It is important to find balance between strategically planned, robust IT infrastructure and one that can be reactive and flexible enough to accommodate new, more, or different technologies as they become available.”¹⁴ Students living on campus rate their network experiences considerably lower than students living off campus, suggesting that campus networks have some catching up to do. Students have an increasing “always connected” mentality—this is a natural result of increased device ownership and increased availability of Wi-Fi in commercial spaces. While cellular data service can fill in the gaps on campus where Wi-Fi isn’t present, data plans can be expensive, and Wi-Fi is becoming an expected service in the digital age. The survey results suggest that the expectations among many students for reliable Wi-Fi access on campus are not being met—campus network administrators will need to assess their Wi-Fi infrastructure and identify improvements needed. For some campuses this may be the pervasiveness of the Wi-Fi network, the reliability of the network, or ease of network access...or all three.

50%

of students say campus network performance (e.g., high speed, no interruptions) is good or excellent—students living on campus (36%) rate it considerably lower than students living off campus (54%)

58%

of students say reliability of access to Wi-Fi throughout campus is good or excellent—students living on campus (46%) rate it considerably lower than students living off campus (61%)

“Based on experiences with recent emerging technologies, it is safe to say that use cases for the IoT haven’t been considered yet. The ambiguity of the unknown presents the greatest challenge for universities to accommodate the invasion of IoT.”

—Stephen diFilipo, CIO

Mobile Devices and Student Learning

Students and faculty have similarly high levels of interest in using mobile devices to enhance learning, but the actual use of these devices in academics remains low, despite their increased prevalence.

The Promise and Practice of BYOD

According to a 2013 ECAR study of IT leaders, teaching and learning opportunities are an exciting prospect for the BYOD era. The abundance of student-owned devices provides the opportunity to diversify and expand the teaching and learning environment.¹⁵ The two recommendations stemming from this finding were 1) be mobile-ready, i.e., be willing and able to provide a mobile-friendly environment that meets student, faculty, and staff expectations; and 2) collaborate with other units to formalize systems for guiding students and faculty in incorporating mobile, networkable devices into curriculum and pedagogy. The 2015 student study assesses the progress higher education has made since the 2013 ECAR BYOD study.

To better understand how students use their devices in class, we asked about typical in-class activities. Students employ laptops more than tablets or smartphones for notetaking, connecting with learning materials, or using a digital device for instructor-directed in-class activities (figure 7). Interestingly, faculty overestimate students' use of laptops for these activities. Fifty-seven percent of faculty think students typically use their laptops in class to take notes, while 42% of students say they typically take notes on their laptops (15 percentage-point difference). Students use smartphones more than laptops or tablets for nonclass activities (such as checking e-mail or texting). Again, faculty greatly overestimate (or students underreport) the extent of their use. Fifty-five percent of faculty think students typically use smartphones in class for nonclass activities, while 36% of students admit to this (a 19 percentage-point difference). As noted in the ECAR faculty study:

Faculty policies on the use of mobile devices in the classroom depend on a host of factors. A faculty member who thinks that students use the devices for class-related activities or that such technologies can enhance the student learning experience is more likely to encourage or require the use of those devices. However, if faculty find that the use of mobile technologies in the classroom is distracting either to students or themselves, then the probability of the devices' being banned or discouraged increases significantly.¹⁶

Overall, faculty tend to overestimate (or students underreport) the use of laptops and tablets as productivity devices and the extent to which all three types of mobile devices are distractors. While there is no guarantee that students will

Percentage of students wanting their instructors to more often use students' devices in class as learning tools:

39%
smartphone

40%
tablet

56%
laptop

Student Advice for Faculty: "Use online content to enhance lecture material such as real-life application examples."

use their devices in class for instructor-directed in-class activities, developing assignments or activities that use devices is one way to help students focus/refocus attention on class-related work.

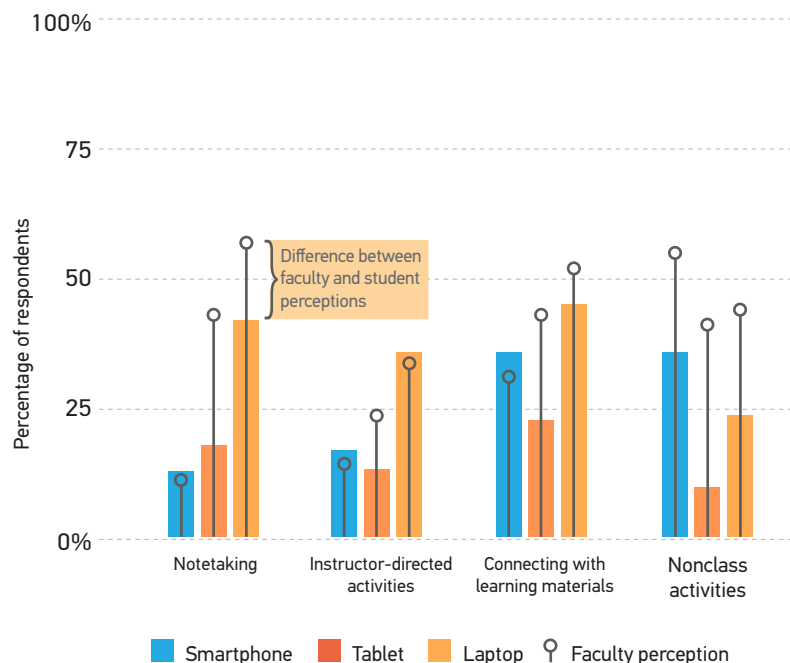


Figure 7. Differences between how student say they use—and how faculty think students use—their devices in class

Do I have a technology problem, or do I have an engagement problem?

Is the solution to the BYOD distraction problem in class to “close the lid” on laptops and put smartphones away, as Clay Shirky did in his NYU class on social media?¹ “So this year, I moved from recommending setting aside laptops and phones to requiring it, adding this to the class rules: ‘Stay focused. (No devices in class, unless the assignment requires it).’” His rationale was linked to research on the negative impact of multitasking on the quality of cognitive work.

Although we don’t dispute these findings, we do challenge the concept that students are more likely to focus on the instructor or course materials when they are technology-free. As long as there are Mead Pee-Chee folders to doodle on, grocery lists to make, windows to stare out of, student newspapers to read, and minds to wander, instructors will face distracted students. To Shirky’s credit, he concludes his blog post with the observation that focus and engagement are a partnership between teacher

and student. “Professors are at least as bad at estimating how interesting we are as the students are at estimating their ability to focus. Against oppositional models of teaching and learning, both negative—Concentrate, or lose out!—and positive—Let me attract your attention!—I’m coming to see student focus as a collaborative process. It’s me and them working to create a classroom where the students who want to focus have the best shot at it, in a world increasingly hostile to that goal.”²

Shirky’s close the lid argument makes sense from a theoretical cognitive perspective—multitasking is bad and focused concentration is good for learning. But it doesn’t account for the reality of today’s undergraduates. They are connected to the Internet, they rely on their devices to communicate, and they use their devices for the business of being a student. Taken out of context, Shirky’s quote about “concentrate, or lose out” could be used to support the argument that students’ devices could be used in classrooms to promote student engagement (e.g., digital quiz, poll, or other on-demand response activity; backchanneling with other students; teaching assistant Q&A; DIY fact-finding to ask smarter questions or give smarter answers; etc.). As faculty notice their students looking at a phone screen or clicking a keyboard in a suspiciously vigorous way, they need to ask themselves, “Do I have a technology problem in my class, or do I have an engagement problem?” Ironically, using technology in relevant, interactive, and creative ways can solve the engagement problem. Likewise, non-tech-based engagement can help prevent students from sneaking glances at Instagram, Facebook, and text messages while in class.

Mobile devices in class don’t have to be a Kobayashi Maru (no-win) situation.³ Faculty members need to find their own path on the basis of their comfort level with technology, their curriculum, and pedagogy that supports their subject matter. Most institutions have faculty teaching/excellence centers (73%) and/or instructional designers (86%) who can help them find that path.⁴

—*Eden Dahlstrom, Director of Research, EDUCAUSE*

1. Clay Shirky, “[Why I Just Asked My Student to Put Their Laptops Away](#),” September 9, 2014.
2. Ibid.
3. [Kobayashi Maru](#) is a Starfleet training exercise designed to test the character of cadets when faced with a no-win situation (*Wikipedia*).
4. EDUCAUSE Core Data Service, 2014.

The guidelines students receive for using their mobile devices in class reflect faculty concerns about smartphones as distractors and perceptions that laptops facilitate classroom learning (figure 8). Our results from the past three years show slow but measurable growth in acceptance of personal mobile device use in the classroom. Sixty-three percent of students said their faculty ban or discourage the use of smartphones in class in 2015, compared with 69% in 2014 and 74% in 2013.

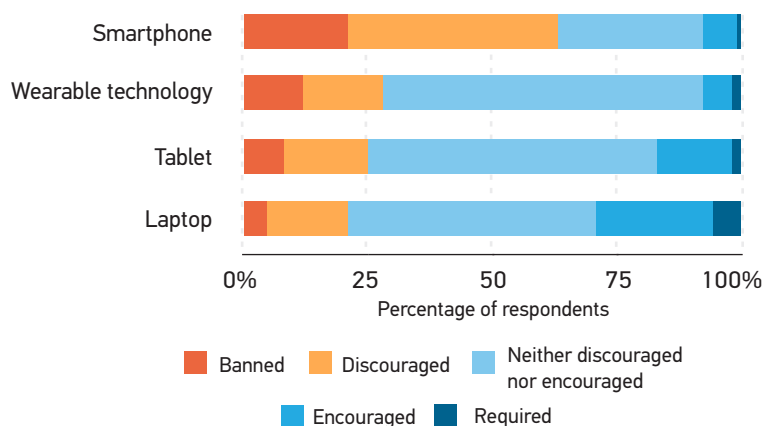


Figure 8. Students' in-class BYOD experiences

Mobile Devices and Socioeconomic Status

According to Pew Research Center data, smartphone ownership is highest for younger, more educated, and higher-income adults. A slightly different population is inclined to be “smartphone-dependent,” however. According to a recent Pew study, minorities and lower-income Americans depend on these phones for Internet access at higher rates than the general population. Evidence of this surfaced in the 2015 ECAR student study findings. First-generation college students, those who received free or reduced-cost lunch in high school, and/or those attending a community college gave higher importance ratings to their mobile devices for academic and administrative functions than other types of students.¹ These same types of students are also more positive than their counterparts about their college's use of their mobile devices to track proximity, location, and social media activities. This may suggest that lower-income students not only rely on mobile devices to a greater degree but also are more comfortable with them. Mobile deployment of college services, applications, websites, and academic assignments meets the expectations not only of students who prefer to use their smartphones for college-related business but also of students who depend on their smartphone as their primary connected device.²

1. For example, the percentage of students tracking financial aid transactions from a mobile device differed significantly by free and reduced-cost lunch eligibility (yes = 65% versus no = 40%), first-generation status (yes = 60% versus no = 43%), and attending a community college (yes = 57% versus no = 40%).
2. Monica Anderson, “6 Facts about Americans and Their Smartphones,” Pew Research Center FactTank, April 1, 2015.

Mobile Devices to Enhance Learning

Students and faculty have similar attitudes about the potential of mobile devices to both enhance learning and distract from learning in the classroom. In 2013, ECAR asked students if in-class use of mobile devices could enhance learning; fewer than half of students (41%) agreed with the statement. In 2014, ECAR asked students if in-class use of mobile devices is distracting; nearly half (47%) agreed. In 2015, ECAR dug a bit deeper by asking *for whom these devices were distracting*—students said “for me” (41%), “for other students” (49%), and “for my instructors” (54%). Students’ concerns about mobile devices’ being distracting is more external (your problem) than internal (my problem). About half of students (52%) are aware that multitasking with IT devices prevents them from concentrating, but only 28% of students agreed that technology interferes with their ability to concentrate and think deeply about the subjects they care about.

Discouraging or banning certain types of devices is becoming more complex, as touchscreen laptops and docking keyboards for tablets are blurring the lines between laptops and tablets (or “laplets”) and as large-screen smartphones (or “phablets”) approach the size of an iPad mini. ECAR will continue to watch this trend and forecasts that as device fluidity evolves, more traditional devices will be replaced with these hybrid devices. Hybrids are already in use: About one in five (19%) of the 91% of the study’s laptop owners have touchscreen capabilities. About a quarter of hybrid-laptop owners (27%) use these devices equally as laptops and tablets, but most (69%) typically use them like a traditional laptop. Of the 54% of students who own a tablet, 3 in 10 have docking stations (30%). Thirty-eight percent of tablet owners with docking stations said they use these equally like a tablet and laptop, whereas 42% typically use these like a traditional tablet.

There are more devices in students’ pockets, backpacks, and purses now than ever, and substantially more students use these devices for coursework now than three years ago. Laptop usage is almost universal. Significantly more students are using tablets and smartphones for academic work. However, mobile devices’ importance to students’ academic success has not changed (figure 9). This is likely because few faculty are integrating mobile capabilities into their teaching:

- Few instructors (17%) said their institution makes mobile learning a priority.
- About a third of instructors (32%) create assignments that incorporate mobile technology.
- Some instructors ban or discourage devices in class: 49% ban smartphones, 19% tablets, and 16% laptops.
- Nearly two-thirds of instructors (60%) are concerned that in-class use of mobile devices can be distracting for students.¹⁷

Student Advice for Faculty: *“Have better preparation to integrate technology into course.”*

Student Advice for Faculty: *“Be more available via e-mail or on discussion boards to answer questions. Send grade updates via e-mail as well.”*

Faculty are generally open to integrating students' mobile devices into their courses. Half (52%) of faculty believe the use of mobile devices in class can enhance learning. So why isn't mobile taking off? Many faculty need more help to make it happen. Half of faculty say they'd like to have more training/professional development around effectively incorporating mobile devices into their courses.

Student Advice for Faculty: "Use more technology to keep students involved, such as using their phones to answer questions."

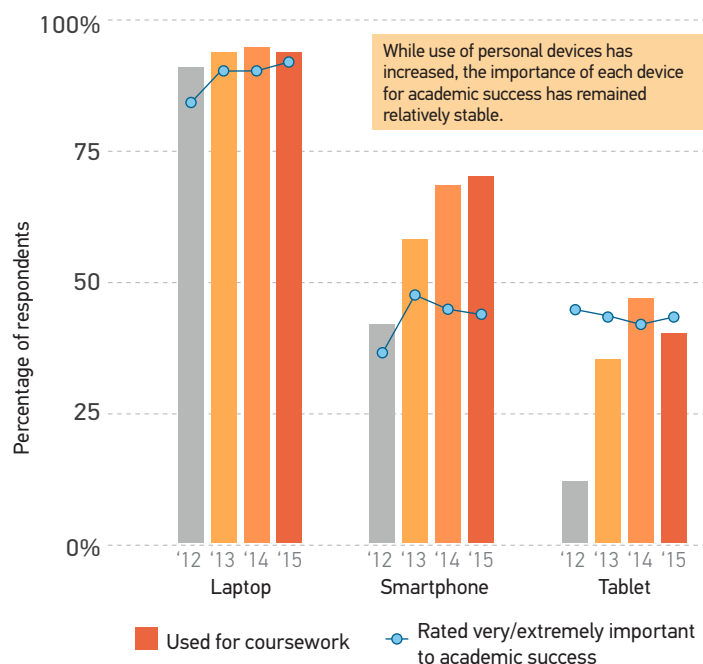


Figure 9. Extent of use and the level of importance of devices for academics

Mobile Devices and Student Services

Mobile devices are also being incorporated into student services. Depending on the service, nearly all students (85–97%) reported that they can access enterprise systems from their handheld mobile devices. While students don't need a mobile device to access these resources, many want mobile access: 36% said tablets and 44% said smartphones were very or extremely important for accessing student services. Figure 10 shows the mobile-enabled services students use and their experiences with them. Grades, course content, and the LMS (which overlaps with these because it often provides grades and content) are the three most common institutional services that students access from a mobile device. Importance ratings and experience ratings generally track with use. Course registration may provide the most room for improvement, because students' performance ratings were low in relation to their importance ratings.

Student Advice for Faculty: “[Enable] us to connect outside of class time for collaborative work.”

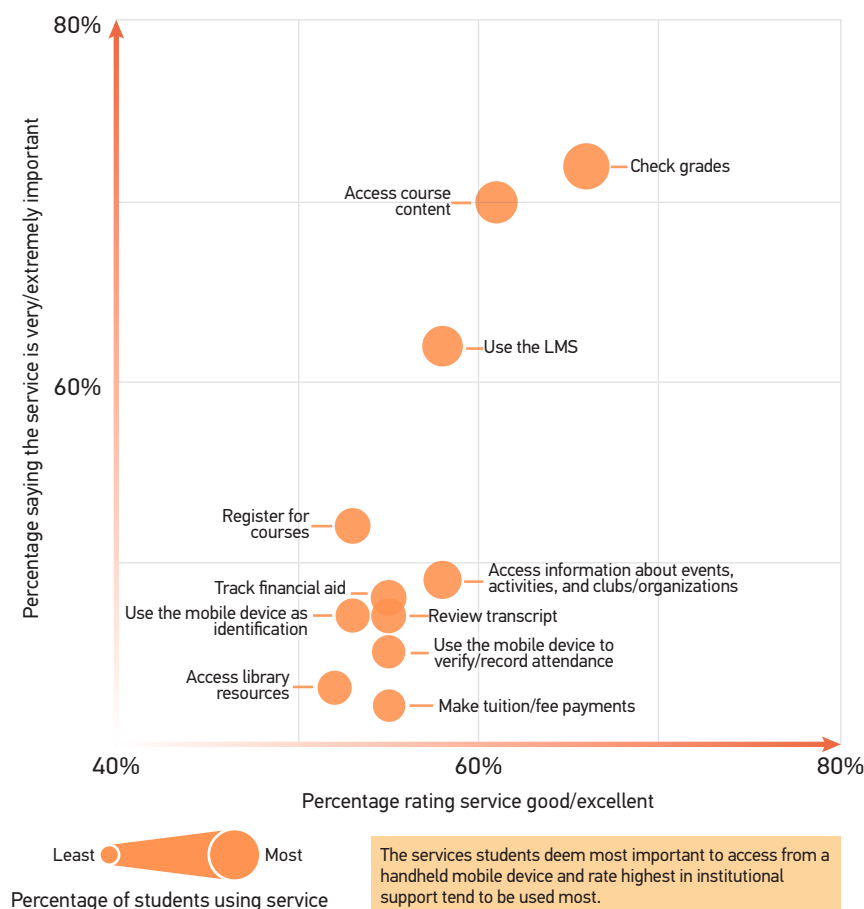


Figure 10. Use, importance, and performance ratings of institutional services on mobile devices

Technology Resources and Tools

Although students use technology extensively, we have evidence that technologies are not achieving their full potential for academic use. Meaningful and intuitive use of technology for academics cannot be assumed, even when a technology is widely available or used in other contexts.

Technology Presence in Classes

ECAR asked students to share their experiences with a set of resources and tools that are typically found on college campuses. For each technology, we examined students' use, whether they wished their instructor used it more, and whether they felt they could be more effective students if they were better skilled at using it. We used these comparisons to consider the extent to which institution-provided technologies are achieving their full potential (figure 11). Many of the students who have used technologies in at least one course say they could be more effective if faculty used them even more and if they (the students) were better skilled at using them. These technologies include:

- Search tools to find references or other information online for class work
- LMS
- Online collaboration tools
- Laptops during class
- E-books or e-textbooks
- Smartphones during class
- Online blogs or discussion/collaboration tools related to class work
- Social media as a learning tool

A few less commonly used technologies solicited student interest in faculty's using them more and in gaining more skills themselves:

- Recorded lectures or lecture capture
- Simulations or educational games
- 3D printers

Some technologies may be achieving their potential:

- Software to create videos or multimedia resources
- Tablet use in classes
- Nonkeyboard or nonmouse interfaces
- E-portfolios

Student Advice for Faculty: *"Be more familiar with technology I use."*

Institutions can use these data to guide decisions about investing in broader deployment or deeper training for faculty use or student access.

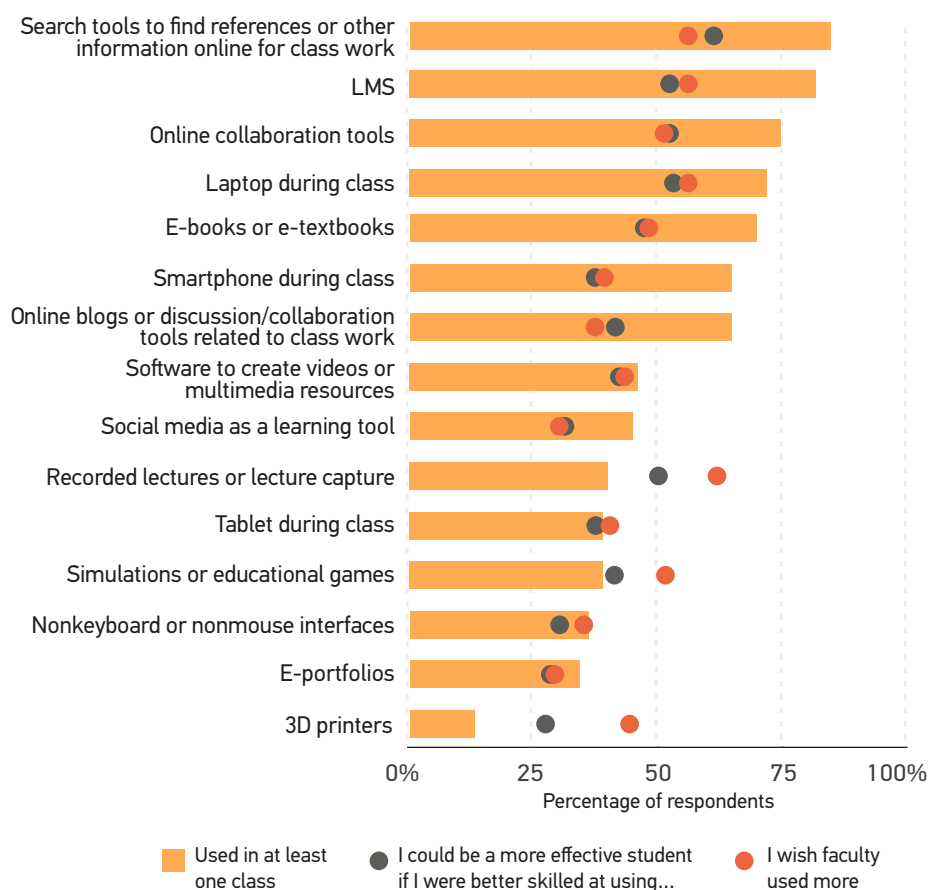


Figure 11. Student experiences with and expectations for technology-based resources and tools

“Technology can be a powerful learning tool. When used effectively, it brings learning to great new heights.”

—Esteban Cruz, MBA, PMP,
Chief Information Officer,
Lincoln Land Community
College

Analytics and Data Privacy

Most students support institutional use of their data to advise them on academic progress in courses and programs. Many of the analytics functions students seek already exist in commercial digital learning environments.

Student Success Analytics

Student success analytics drives the technologies that provide personalized learning opportunities, notifications, alerts, and recommendations to students. Students are interested in the technologies that can help them complete courses, improve learning, achieve their degrees, and generally improve their experiences as students (figure 12).

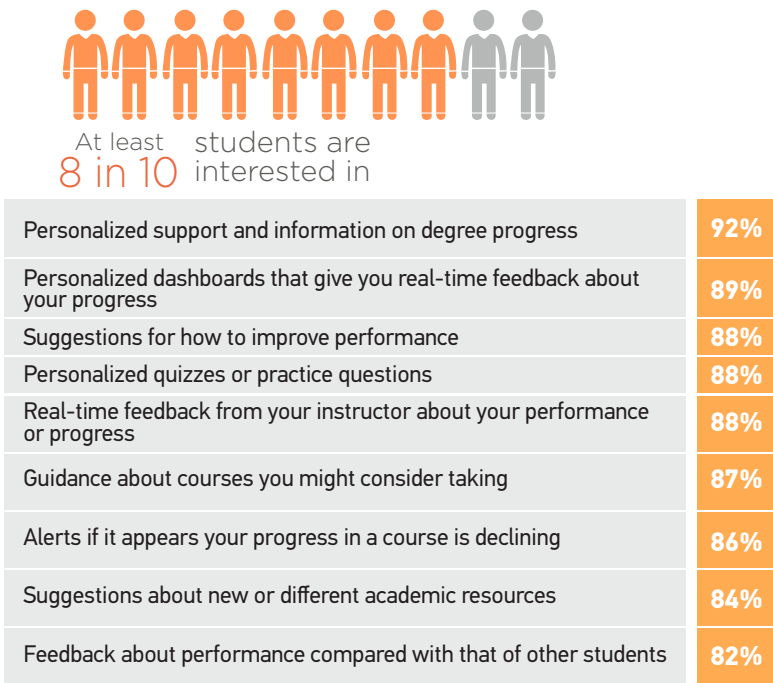


Figure 12. Student interest in early alerts, personalized messages, and intervention notification services

Early-alert systems are designed to identify potential academic trouble as soon as possible and issue notifications or triggers (to students, instructors, advisors, and/or others, depending on how the alerts are configured). These systems are among the highest on students’ “wish list” of resources for faculty to use more: Two in three students (63%) want instructors to use early-alert systems

more. Institutions are moving to grant that wish: Early-alert systems were one of the most commonly deployed student success technologies in 2014 (broad deployment by one in three institutions; limited/targeted deployment at two in five; and initial deployment at one in five).¹⁸ As early-alert systems become more sophisticated in both their automation and ability to integrate fully with LMSs and other enterprise tools, the opportunities for students to receive real-time, up-to-the-minute data on their academic standing in courses may improve significantly.

Personalization and Data Privacy

The utility of many student success technologies rests on incorporating detailed information about each student into the system communicating that information to relevant constituents. Such personalization of notifications and messaging requires institutions to collect more and better information about students' interests, behaviors, and activities. ECAR asked students how they felt about their institution's collecting data from or about them to inform individualized messaging about academic progress, training, and guidance (figure 13). Students are more comfortable sharing their academic performance and progress (e.g., performance in courses and progress toward a degree) than their personal behaviors (e.g., campus-based or web-based activities).

Fifty-eight percent of students said they think it is generally a good idea for their college/university to use their data to create individualized messages about academic progress, training, and guidance opportunities (only 15% said this was a bad idea). Students' opinions are divided about institutions' potentially combining data about school-related activities with their social-media and mobile-device data to enhance academic experiences, assess institutional impact, or tailor offerings to meet students' needs and expectations (32% of students thought this was a good idea; 36% thought this was a bad idea). Students are more comfortable with helpful "big mother" uses of their personal data—those that directly serve their matriculation interests—than with those that seem like creepy "big brother" activities—monitoring or surveilling activities in ways that are not clearly linked to their matriculation interests.¹⁹ Faculty responses paralleled students', with about the same level of enthusiasm about "big mother" and a little more caution about "big brother."

73%

of students said they like to keep their academic and social lives separate

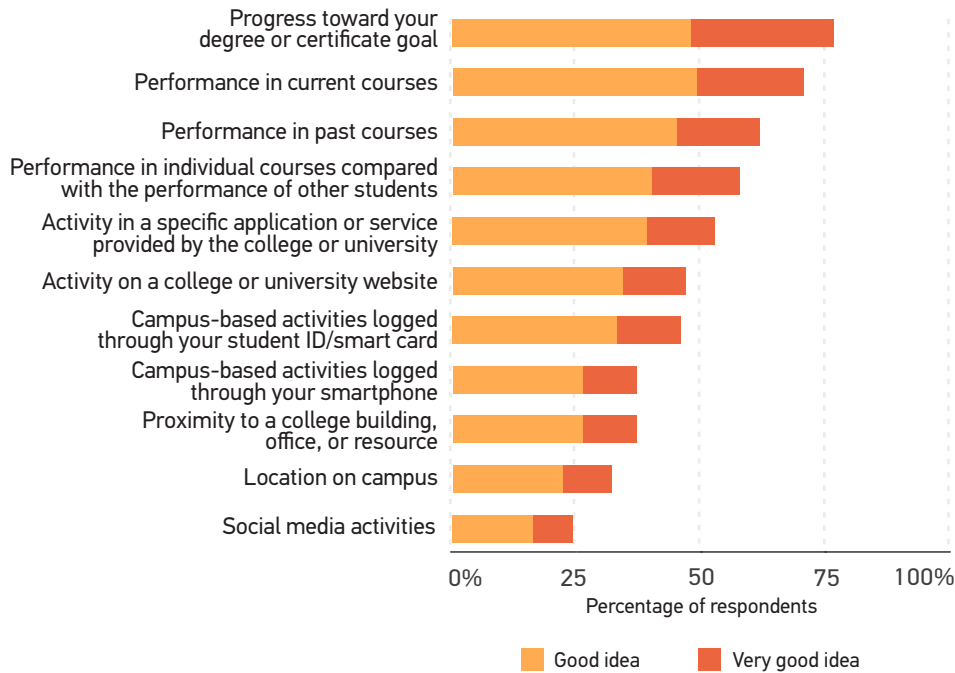


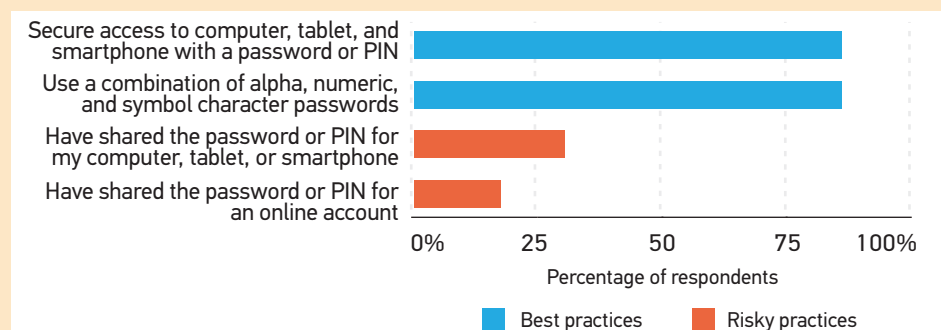
Figure 13. Student opinions about data collection for analytics

Students' InfoSec Hygiene

Millennials are often maligned for not thinking about data privacy. A 2015 study by the American Press Institute showed that 34% of millennials (those under the age of 35) didn't worry at all about their personal information being available online; and only 46% worried a little. That same study found that when millennials do worry about privacy, they worry most about identity theft.¹

Our research shows that worrying about identity theft is not entirely unfounded. Twenty-one percent of respondents have had an online account hacked, and 14% have had a computer, tablet, or smartphone stolen. Identity theft commonly results from hijacked online accounts and stolen computing devices, and the sensitive information they hold.²

Most students practice good information security hygiene (see figure below). They secure access to their computing devices with passwords and PINs, and they use strong passwords with a combination of alpha, numeric, and symbol characters (both 86%). They rarely share passwords and PINs for their online accounts (17%). In addition, fewer than a third of students have shared the passwords or PINs for their computing devices (30%). Students who have shared a password or PIN for a computer, tablet, or smartphone in the past 12 months are more likely to have had an account hacked than students who haven't (29% versus 18%).



Students' information security hygiene

—Joanna Grama, Director of GRC and Cybersecurity Programs, EDUCAUSE

1. American Press Institute, "Digital Lives of Millennials," March 16, 2015.
2. IdentityTheft.gov, "When Information is Lost or Exposed."

New Models for Education

New models for education, such as MOOCs and competency-based credentials, haven't yet translated to behavioral or attitudinal changes for undergraduates. The majority of students say they learn best with a blend of online and face-to-face work.

Students and MOOCs

Half of the students surveyed (49%) said they had taken an online course in the past year, a slight increase from the past two years (46% in 2013 and 47% in 2014). More undergraduate students took a MOOC in the past year than in previous years these data were tracked—9% took a MOOC in 2015, compared with 6% in 2014 and 3% in 2013 (figure 14). There has been no notable increase in the percentage of students who are familiar with MOOCs in 2015, likely due to waning media coverage. Three out of four students (74%) said that they don't know what a MOOC is (76% in 2014 and 74% in 2013). More students who took a MOOC in the past year completed it, with 52% of MOOC takers saying they finished the course, compared with 47% in 2014. Of those who completed the MOOC, about 4 in 10 (38%) said they earned a digital badge or certificate (about the same as in 2014, 37%, and down from 44% in 2013). About a quarter of MOOC takers (in 2015 and 2014) didn't know whether they had earned a digital badge or certificate. This is a reasonably good indicator that using badges/certificates to document competencies developed by MOOC takers is not a high priority for people already enrolled as undergraduates in traditional colleges and universities.

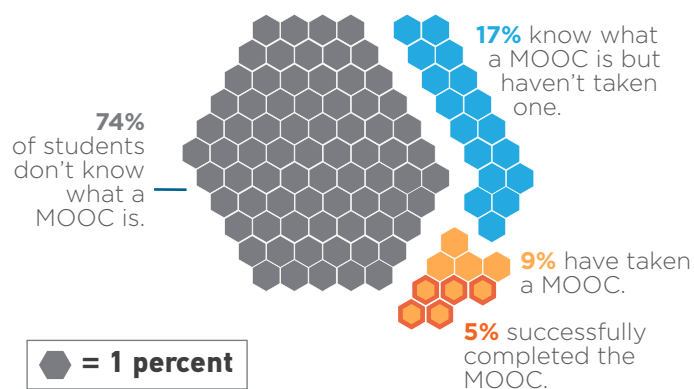


Figure 14. Students' experiences with MOOCs

In the past year:

9%

of students took a MOOC

11%

earned a competency-based badge

19%

said they'd use a competency-based digital badge on a résumé

In their life:

61%

of students took at least one online course (or participated in a completely online competency-based program)

Degrees and Competency-Based Credentials

The cornerstone of competency-based education (CBE) is the ability to demonstrate skill or mastery of a subject outside the confines of rigid time-based constraints.²⁰ The implications to higher education are significant because CBE challenges the time, place, modality, and linearity of traditional educational models. Western Governors University pioneered CBE in the late 1990s; today’s traditional undergraduates (ages 18–24) spent their high school/precollege years in a world where CBE was an alternative to traditional undergraduate programs. ECAR found that 11% of undergraduates reported earning a digital badge or other type of digital credential that acknowledges their competency in a topic, activity, or subject area. Do students find these credentials meaningful enough to list on a résumé? About one in five of all students (19%) said they would list one on their résumé; the number almost doubles (37%) among students who have actually earned a digital credential. Students are far likelier to document traditional credentials such as undergraduate degrees (88%), work experience (64%), and certificates from an accredited college or university program (52%) on a résumé (figure 15). This is similar to the pattern we found in 2014.

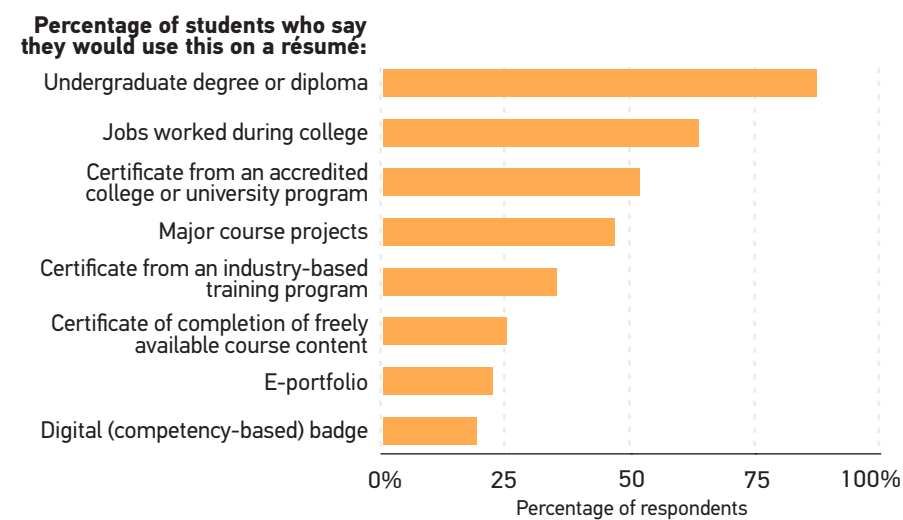


Figure 15. Student intent for using degrees, certificates, badges, and other credentials on their résumés

Percentage of faculty who support less traditional educational models:

65% open educational resources

63% competency-based education

39% gamification

37% badges or digital credentials

37% MOOCs

—ECAR Study of Faculty and Information Technology, 2015

Digital Learning Environments

Most students have experienced a digital learning environment—a learning situation that leverages technology to extend learning beyond the face-to-face classroom experience. Half of students (49%) have taken a course in the past year that was offered *completely* online, and 81% of students said that at least some of their courses were partially online and partially face-to-face (i.e., blended). Figure 16 depicts the extent to which students experienced blended learning environments in their courses in the past year.

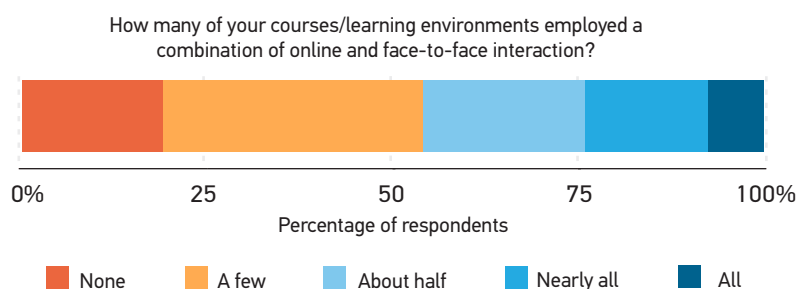


Figure 16. Students' blended course experiences

These data haven't changed much since 2013; progress has been slow for blended learning expansion in higher education. This means a lot of students have been exposed to blended learning environments, but blended has not yet hit the mainstream. The evolution of LMSs to more collaborative and engaging digital workspaces should help expand the reach of blended pedagogical models. As new LMS technologies are deployed, institutions will need to train, support, and encourage faculty to use the advanced features that constitute what has been called the next-generation digital learning environment (NGDLE). According to an April 2015 paper from the EDUCAUSE Learning Initiative on the topic, this next-generation environment will have the following dimensions:

- **Interoperability (and Integration):** Interoperability is the linchpin of the NGDLE. The ability to integrate tools and exchange content and learning data enables everything else.
- **Personalization:** Personalization is the most important user-facing functional domain of the NGDLE.
- **Analytics, Advising, and Learning Assessment:** The analysis of all forms of learning data—resulting in actionable information—is a vital component of the NGDLE and must include support for new learning assessment approaches, especially in the area of competency-based education.
- **Collaboration:** The NGDLE must support collaboration at multiple levels and make it easy to move between private and public digital spaces.

- **Accessibility and Universal Design:** Efforts to realize the NGDLE should include working toward ensuring that all learners and instructors are able to participate, with access to content and the ability to create accessible learning artifacts. We should strive to address issues of accessibility from the start, based on a universal design approach.²¹

Faculty more commonly use the LMS to push out information (e.g., syllabi and handouts, 61%) than to promote interaction (e.g., discussion boards and collaborative assignments, 44%).²² Students increasingly believe in the value of courses with at least some online components. In 2013, 25% of students with a learning environment preference said they learn most in courses with no online components, and in 2015 half as many (12%) said so.²³

From students’ perspectives, some learning activities may lend themselves better to online (or face-to-face) learning environments. But there is also plenty of overlap in the ability of these two modalities to facilitate learning. ECAR asked students to list the types of activities or assignments they prefer to do online and the types of activities or assignments they prefer to do face-to-face. Table 1 depicts our analysis of a sample of 400 open-ended responses. While the results are somewhat ambiguous, with some items appearing in both columns, assessments and personal assignments characterize online preferences, while the interactive and group assignments typify preferences for face-to-face learning. Students’ preferences for online versus face-to-face work conceptually support flipped-classroom models (where traditional homework and lecture elements are reversed) and blended learning models. In these models, personal assignments would be completed online outside class, and interactive assignments would occur during face-to-face sessions. The *2015 NMC Horizon Report* predicted flipped classrooms as a near-term (1 year or less) technology and increasing use of blended learning as a short-term trend (1–2 years).²⁴

Table 1. Students’ top 5 preferences for online or face-to-face assignments and activities

Online		Face-to-Face	
Quizzes and tests	33%	Lectures	34%
Homework	25%	Discussions/Q and A	17%
Writing assignments	12%	Quizzes and tests	12%
Discussions, group work	11%	Any/all activities	11%
Paper/assignment submission	9%	Projects/group projects	11%

Percentage of students who said they learn most in courses with *no* online components:

25%
in 2013

12%
in 2015

Conclusions and Recommendations

Although technology is omnipresent in the lives of students, leveraging technology as a tool to engage students in meaningful ways and to enhance learning is still something of a promise rather than a practice. This is an enduring conclusion from previous studies. Students generally have positive inclinations toward technology, and most students said they were prepared to use technology when they entered college; yet a smaller percentage of today's undergraduates said they get more actively involved in courses that use technology than students from the 2012 study. Optimizing the impact of IT in academics will take thoughtful leadership to help bridge the gaps between student experiences with technology inside the classroom and their experiences outside the classroom. Helping faculty incorporate strategic, pedagogically sound uses of technology into their teaching practice can facilitate a sense of student connectedness and engagement.

Identify and clarify your institution's priorities for technology in academics.

Your institution's greatest need might be to improve learning or teaching, strengthen student success analytics, expand and upgrade campus networks, or something else. You may have just one or several priorities. Begin by identifying the institution's strategic priorities and then invest in academic technology accordingly.

Leadership catalyzes success. ECAR research has consistently identified leadership as fundamental to successful technology adoption in higher education. If you want to advance in student success, if you want to expand and deepen faculty use of technology, and if you want to expand access to your institution via online learning, you will need dedicated, tireless leadership to make significant and sustained progress and to facilitate buy-in.

Use technology to connect and engage learners. Students want more technologies incorporated into their learning experiences, and faculty are open to learning how to use technology that can connect and engage students. Determine the priorities most important to your students and faculty and most feasible to your environment and budget, and deliver them. Technology has rarely been a strategic differentiator in higher education, but this may be changing as students' expectations are growing and as their options are expanding.

Mobilize. This year's student study closely examined students' hopes and needs for incorporating mobile devices and services into their academic and institutional experiences. Institutions have a gap to bridge to bolster their networks, expand mobile access to student services, and help faculty integrate mobile devices into their teaching.

Nothing succeeds like...student success technologies. Everyone benefits when students find the right degree program for their needs, complete their courses expeditiously, and attain their degrees within reasonable (and cost-effective) time frames. New applications of analytics to these objectives are gaining in adoption and effectiveness. Both students and faculty are interested. It is time to determine the best role and adoption pace for student success technologies and services at your institution. EDUCAUSE has resources to help institutions, no matter where they are in this journey:

- [ECAR benchmarking study on integrated planning and advising services \(IPAS\)](#)
- [ECAR report on the assessment and evaluation of integrated planning and advising services](#)
- [ECAR handbook on IPAS implementation](#)
- [ECAR report on IPAS data systems and integration](#)
- [ECAR IPAS infographic](#)
- [ELI *7 Things You Should Know About IPAS*](#)
- [EDUCAUSE key questions](#) and [executive brief](#) on the foundations of personalized pathways
- [EDUCAUSE Benchmarking Service Beta](#)—for student success technologies maturity and deployment index assessment service

It takes a village...of faculty. Our research has shown how eager students are to expand and deepen their academic uses of technology and how open faculty are to using technology. This year's study also suggests that the greatest current impediment is probably undersupported faculty. Faculty need reasonable evidence about which technologies most benefit students, and they need help incorporating those technologies into their teaching. Help students learn by helping faculty teach with technology.

Know where you stand. Take advantage of EDUCAUSE resources to benchmark your institution's technology practices and needs against others and join a community of educational technology experts:

- [Benchmark student and faculty needs and readiness](#) by participating in the ECAR student and faculty studies.
- [Benchmark your institution's technology practices and services](#) by participating in the Core Data Service and its new enhanced benchmarking reports.
- Join the community of IT professionals and leaders as well as faculty by becoming a member of the [EDUCAUSE Learning Initiative](#).

Methodology

In 2015, ECAR conducted its latest annual study of undergraduate students and information technology to shed light on how IT 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 2015 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 9 and April 10, 2015, and 50,274 students from 161 institutional sites responded to the survey (see table 2). ECAR issued \$50 or \$100 Amazon.com gift cards to 39 randomly selected student respondents who opted in to an opportunity drawing 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.

Table 2. Summary of institutional participation and response rates

Institution Type*	Institution Count	Invitations	Response Count	Group Response Rate	Percentage of Total Responses	U.S. Subsample (n = 10,000)**
AA	23	186,135	9,195	5%	18%	46%
BA public	19	12,568	672	5%	1%	3%
BA private	8	8,005	1,032	13%	2%	4%
MA public	29	186,456	12,223	7%	24%	14%
MA private	16	44,269	3,294	7%	7%	8%
DR public	37	350,039	15,567	4%	31%	21%
DR private	10	38,390	2,414	6%	5%	4%
Total U.S.	142	825,862	44,397	5%	88%	100%
Canada	7	40,188	1,450	4%	3%	–
Other countries	12	104,034	4,427	4%	9%	–
Grand total	161	970,084	50,274	5%	100%	–

* U.S. institutions not falling into the listed types were reclassified.

** Via a stratified random sample

Countries represented in the non-U.S. sample

- Australia
- Canada
- Finland
- Hong Kong
- Kuwait
- Kyrgyzstan
- Lebanon
- South Africa
- Trinidad and Tobago
- Turkey

The quantitative findings in this report were developed using a representative sample of students from 142 U.S.-based higher education college and university sites. 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 (see table 3). This sample was based on IPEDS data on age, gender, ethnicity, Carnegie class, and institutional control (public/private) for U.S. undergraduates. (A similar methodology was used for the 2014 sample.) The 2015 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. Non-U.S. respondents' results are not highlighted in this report. 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.

Table 3. Demographic breakdown of survey respondents

	U.S. Full Sample	U.S. Subsample	Canada	Other Countries
Basic Demographics				
18–24	78%	70%	65%	86%
25+	22%	30%	35%	14%
Male	37%	44%	32%	54%
Female	63%	56%	68%	46%
White	59%	54%	–	–
Black/African American	6%	12%	–	–
Hispanic	14%	16%	–	–
Asian/Pacific Islander	11%	8%	–	–
Other or multiple races/ethnicities	11%	10%	–	–
Student Profile				
Freshman	25%	27%	46%	32%
Sophomore	23%	28%	30%	23%
Junior	23%	20%	11%	21%
Senior	20%	15%	7%	14%
Fifth year	6%	5%	1%	8%
Other class standing	4%	5%	5%	2%
Part time	18%	27%	7%	8%
Full time	82%	73%	93%	92%
On campus	30%	22%	10%	22%
Off campus	70%	78%	90%	78%
Academic Goal				
Digital badge(s)	12%	13%	22%	28%
Vocational/occupational certificate	9%	11%	27%	16%
Associate's degree	19%	33%	20%	9%
Bachelor's degree	79%	73%	50%	74%
Master's degree	39%	36%	22%	56%
Doctoral degree	15%	14%	6%	22%
Another professional degree	10%	10%	7%	11%
Other goal	2%	2%	11%	2%
Major				
Agriculture and natural resources	2%	1%	4%	3%
Biological/life sciences	9%	8%	4%	6%
Business, management, marketing	14%	15%	16%	15%
Communications/journalism	4%	4%	2%	1%
Computer and information sciences	7%	9%	7%	11%
Education, including physical education	7%	6%	6%	5%
Engineering and architecture	9%	9%	8%	31%
Fine and performing arts	4%	3%	1%	1%
Health sciences, including professional programs	15%	17%	19%	6%
Humanities	3%	2%	3%	5%
Liberal arts/general studies	3%	3%	2%	0%
Manufacturing, construction, repair, or transportation	0%	1%	2%	1%
Physical sciences, including mathematical sciences	3%	2%	1%	4%
Public administration, legal, social, and protective services	2%	2%	5%	2%
Social sciences	8%	7%	5%	4%
Other major	8%	8%	14%	5%
Undecided	2%	3%	2%	1%

Acknowledgments

This study was made possible by the collective efforts of survey administrators from the 161 college and university sites that participated in the 2015 student study (see appendix A). Each representative secured institutional approval to participate in the study, provided sampling plan information to our team, and distributed the ECAR student survey link to their institution's students. This research is an example of a symbiotic partnership between ECAR and higher education institutions; it could not happen without your contribution. Thank you for your contributions to this ongoing examination of student views of technology in higher education.

It takes a village to bring a project of this size and scope into the world. The subject-matter experts who contributed their expertise, insight, commentary, and suggestions at various stages of the project are among this village's most important denizens. Their contributions helped us understand what we should be asking about and how to interpret the results. We thank the following individuals (in alphabetical order):

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- Jennifer Sparrow, Senior Director of Teaching and Learning Technology, The Pennsylvania State University

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Notes

1. Technology inclination is determined by a composite score of usage, attitude, and disposition. High tech inclination = a composite score of 78–100 (roughly the top quartile of students), medium tech inclination = a composite score of 50–77 (roughly the middle two-thirds of students), and low tech inclination = a composite score of 0–49 (roughly the bottom decile of students).
2. National Survey of Student Engagement (NSSE), “NSSE 2013 Topical Modules: Learning with Technology” and “2015 Topical Module: Learning with Technology.”
3. Allison BrckaLorenz, Heather Haeger, Jennifer Nailos, and Karyn Rabourn, “Student Perspectives on the Importance and Use of Technology in Learning,” Indiana University, paper presented at the Annual Forum of the Association for Institutional research. May 18–22, 2013, Long Beach, Calif.
4. OECD, “Students, Computers and Learning: Making the Connection,” PISA, OECD Publishing, Paris, September 15, 2015.
5. D. Christopher Brooks, *ECAR Study of Faculty and Information Technology, 2015*, research report (Louisville, CO: ECAR, October 9, 2015), available from the [2015 Student and Faculty Technology Research Studies Research Hub](#).
6. Pearson, “Pearson Student Mobile Device Survey 2014,” May 9, 2014.
7. Students least confident in their own preparation to use the technologies needed in their courses or who had the lowest tech inclination scores were most critical of their professors.
8. SMSGlobal, “The Smartphone Revolution Infographic,” May 29, 2015.
9. Christina Bonnington, “In Less Than Two Years, A Smartphone Could Be Your Only Computer,” *Wired Magazine*, February 10, 2015.
10. Pew Research Center, “Device Ownership Over Time” (as of October 2014).
11. “Internet of Things,” *Wikipedia*, drawn from International Telecommunication Union, “Overview of the Internet of Things,” June 2012.
12. The survey also asked about desktop computers, wearable technology (e.g., fitness device, smart watch, Google Glass), and Internet-connected gaming devices.
13. EDUCAUSE [Core Data Service](#), 2014.
14. Eden Dahlstrom and Stephen diFilipo, *IT Infrastructure in the Bring-Your-Own Everything (BYOE) Era*, research report (Louisville, CO: ECAR, January 29, 2013), available from the [BYOD and Consumerization of IT in Higher Education Research, 2013, Research Hub](#).
15. Eden Dahlstrom and Stephen diFilipo, *The Consumerization of Technology and the Bring-Your-Own-Everything (BYOE) Era of Higher Education*, research report (Louisville, CO: ECAR, March 25, 2013), available from the [BYOD and Consumerization of IT in Higher Education Research, 2013, Research Hub](#).
16. Brooks, *ECAR Study of Faculty and Information Technology, 2015*.
17. Ibid.

18. These data come from preliminary results of the 2014 student success deployment index. Additional information about EDUCAUSE deployment indices can be found at the [EDUCAUSE Core Data Service](#) website. This deployment index is built into the new [EDUCAUSE Benchmarking Service](#), which will help IT leaders and their colleagues assess and benchmark organizational maturity and technology deployment for strategic initiatives.
19. Bill Carroll of Cornell University is credited with the “big brother” versus “big mother” concept, which he first used in a [keynote](#) in December 2012 to the Hotel Electronic Distribution Association.
20. EDUCAUSE Learning Initiative, *7 Things You Should Know About Competency-Based Education*, February 2014.
21. Malcolm Brown, Joanne Dehoney, and Nancy Millichap, *The Next Generation Digital Learning Environment: A Report on Research*, ELI paper (Louisville, CO: EDUCAUSE, April 2015).
22. Brooks, *ECAR Study of Faculty and Information Technology*, 2015.
23. Most students tend to have a preferred learning environment. Only 11% in 2015 said they didn’t.
24. Larry Johnson et al., *NMC Horizon: 2015 Higher Education Edition* (Austin: The New Media Consortium, 2015).

Appendix A: Participating Institutions

Aalto University	Fleming College
Abilene Christian University	Fordham University
Adams State University	Franklin W. Olin College of Engineering
American University of Beirut	Gallaudet University
American University of Central Asia	GateWay Community College
American University of Kuwait	George Brown College
Appalachian State University	Georgia College & State University
Auburn University	Georgia Southern University
Bethany Lutheran College	Glendale Community College
Brazosport College	Grand Canyon University
Bridgewater State University	Grand Valley State University
Broward College	Greenville Technical College
Brown University	Hamilton College
Bucks County Community College	Heidelberg University
California State Polytechnic University, Pomona	Hofstra University
California State University, Channel Islands	The Hong Kong Polytechnic University
California State University, Chico	Humber College Institute of Technology & Advanced Learning
California State University, Fresno	Ithaca College
California State University, San Marcos	John Wood Community College
Capital University	Joliet Junior College
Central Connecticut State University	Keene State College
Central New Mexico Community College	Lake Superior College
Chandler-Gilbert Community College	Lawrence Technological University
Chatham University	Lethbridge College
City College of San Francisco	LeTourneau University
Clayton State University	Lipscomb University
Clemson University	Louisiana State University
Coppin State University	Loyalist College
Dawson Community College	Marietta College
DeVry University	Marylhurst University
Drexel University	McGill University
Eastern Illinois University	Mesa Community College
Elgin Community College	Messiah College
Emory University	Michigan State University
Estrella Mountain Community College	Middle East Technical University
Fairfield University	Montgomery County Community College
Federation University Australia	

New Jersey Institute of Technology
Northern College
Northern State University
Northwestern University
The Ohio State University
Old Dominion University
Oregon State University
Pace University
Penn State Abington
Penn State Altoona
Penn State Beaver
Penn State Behrend
Penn State Berks
Penn State Brandywine
Penn State DuBois
Penn State Fayette
Penn State Greater Allegheny
Penn State Harrisburg
Penn State Hazleton
Penn State Lehigh Valley
Penn State Mont Alto
Penn State New Kensington
Penn State Schuylkill
Penn State Shenango
Penn State University Park
Penn State Wilkes-Barre
Penn State World Campus
Penn State Worthington Scranton
Penn State York
Phoenix College
Purdue University
Rio Salado College
Saint Francis University
Saint Joseph's University
Saint Michael's College
Salt Lake Community College
San Francisco State University

San Juan College
School of the Art Institute of Chicago
Scottsdale Community College
South Dakota State University
South Mountain Community College
Stonehill College
Tampere University of Technology
Tarleton State University
Temple University
Thomas College
Truman State University
Tufts University
The University of Arizona
University of Arkansas
University of California, Berkeley
University of Cape Town
University of Central Florida
University of Cincinnati
University of Delaware
University of Florida
University of Hong Kong
University of La Verne
University of Louisville
University of Maryland
University of Maryland, Baltimore County
University of Massachusetts Dartmouth
The University of Memphis
University of Michigan–Ann Arbor
University of Mississippi
University of Nebraska at Kearney
University of Nebraska Medical Center
University of Nevada, Las Vegas
University of New Hampshire
University of New Mexico
University of Northern Iowa
University of Oregon
University of Pretoria

The University of South Dakota
The University of Texas at Austin
University of Texas at Brownsville
University of Texas–Pan American
University of Trinidad and Tobago
University of Washington
University of Wisconsin–Superior

Washington University in St. Louis
Wayne State College
Wayne State University
West Virginia University
Western Carolina University
William Paterson University of New Jersey
Winona State University

Appendix B: Validity and Reliability of Semantic Differential Constructs

As in 2014, we asked students to place themselves on a series of 100-point semantic differential scales—scales bound by opposite terms—designed to measure their disposition toward IT, their attitude toward IT, and their usage of IT. Lower numbers indicate certain characteristics about disposition (reluctant, late adopter, skeptic), about attitudes (dissatisfied, discontent, perturbed), and about usage (never connected, peripheral). In contrast, higher numbers on the scale indicate alternative characteristics for disposition (enthusiast, early adopter, cheerleader), attitudes (satisfied, content, pleased), and usage (always connected, central).

As in 2014, students were significantly more positive than negative in their disposition toward IT on every item in this series. That is, students were significantly more likely to refer to themselves as IT enthusiasts, supporters, experimenters, technophiles, early adopters, cheerleaders, and radicals (see figure B1). While scores for some individual items shifted slightly from last year, the overall score for disposition toward technology remained a constant 64.

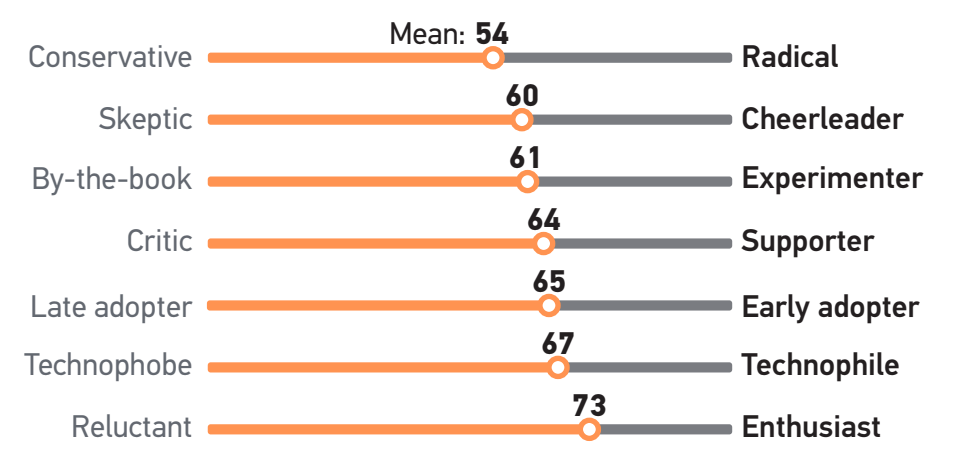


Figure B1. Student disposition toward technology

Students also had significantly more positive than negative attitudes toward IT. While individual mean scores varied slightly from last year, the overall score for attitude toward technology remained constant at 71 (see figure B2).

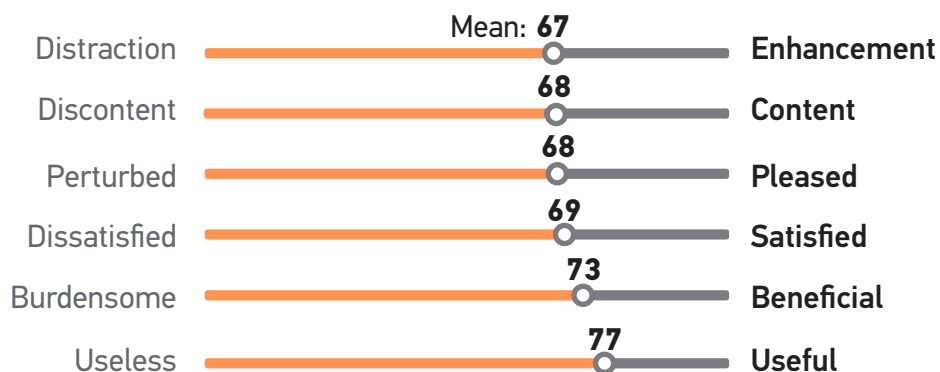


Figure B2. Student attitudes toward technology

Students also continue to report high levels of IT usage (see figure B3). The overall mean score increased from 70 to 73 this year, but this change is partially attributed to removing a low outlier item from the item list.

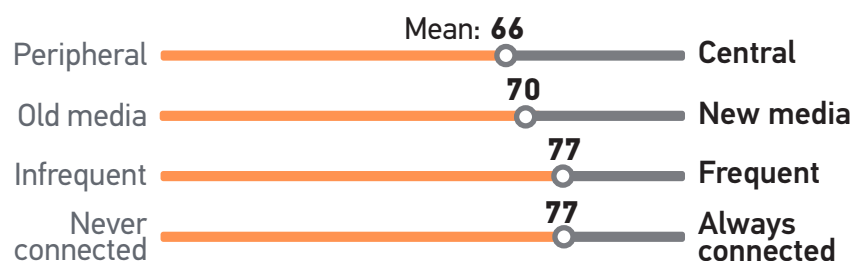


Figure B3. Student usage of technology

Although we established the face and construct validity of the semantic differential scales in the 2014 report on students and technology, we felt compelled to repeat our analyses with the 2015 sample. This not only demonstrates the external validity (validity beyond the original sample on which it was established) of the semantic differential scales but also allows us to make sure that a minor adjustment to the usage scale (removal of the satiable-versus-insatiable item) did not compromise the robustness of our findings. Additional details about this statistical analysis are available upon request through study@educause.edu.