



ECAR Study of Undergraduate Students and Information Technology, 2017

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Foreword

The technologies postsecondary students encounter (and bring with them) on their educational journeys are ever changing and growing in their sophistication and ubiquity. For the fourteenth year, ECAR has sought to map the contours of these changes and growth and to understand students' preferences and experiences through it all. Drawing on responses from tens of thousands of students across dozens of U.S. institutions, this report marks yet another insightful and challenging contribution from our ECAR team to the higher education field's ongoing exploration of students' engagement with technology.

As in previous years, we see among students high levels of adoption of and satisfaction with personal and institutional technologies, as well as optimism about the benefits of technology-based instruction for their own learning. Of course, as this report highlights, the perennial challenge for students in having meaningful plugged-in educational experiences lies in whether and how these technologies are incorporated into their institutions' cultures, structures, and pedagogical methods. Students' desire for more and better technologies in the classroom does not always result in meaningful adoption of those technologies, and this may be especially so if faculty and institutional leaders are not attuned to this desire. This is one of several important contributions of this report—it serves as an amplification of our students' voices as they call out for a more plugged-in and enriched learning experience.

It is my sincere hope that faculty, institutional leaders, higher education professionals, and students themselves will engage deeply with this year's ECAR student report and that this report will enlarge institutions' and higher education leaders' understanding of and resourcing toward students' technology-based preferences and needs. I also strongly encourage readers of this report to read ECAR's companion biennial faculty report, *ECAR Study of Faculty and Information Technology, 2017*. The shifting balance of student and faculty technology-based experiences and preferences, I believe, creates rich opportunities for institutions to innovate and build better paths toward institutional and student success.

May you enjoy and benefit from this excellent report, as I know I have!

—Mark McCormack, EDUCAUSE

Introduction

For 14 years, the EDUCAUSE Center for Analysis and Research (ECAR) has conducted research on information technology and higher education's most important end users, undergraduate students. While the form, function, and findings of these reports have evolved over the years, the common thread that binds them is a desire to understand what students are thinking about and how students are using technology in service to their academics. And although higher education IT organizations are the primary audience for this report, we think that those who run faculty and professional development programs; instructors from every type of institution, discipline, and level of experience; student affairs professionals; and even students themselves can use the findings and recommendations presented here.

In this year's study of undergraduate students and IT, we have elected to present and discuss only findings that have analogs in this year's companion study of faculty and IT. In both this report and the faculty study, readers will find data and analysis related to the following topics:

- Device ownership
- Campus technology experiences
- Security training and practices
- Sources of technology support
- Classroom technology experiences
- Desired technologies for teaching and learning
- Student success technology evaluations
- Perspectives and preferences for teaching and learning environments
- Classroom mobile experiences and policies.

In this way, the reports can be read side by side, in tandem, or as a “call and response” between students and their instructors.

For the 2017 report, 43,559 students from 124 institutions in 10 countries and 40 U.S. states participated in the research. The quantitative findings in this report were developed using the 35,760 survey responses from 110 U.S. institutions. This report makes generalized statements about the findings based on the large number of survey respondents. Applying these findings, however, is an institutionally specific undertaking. The priorities, strategic vision, and culture of an institution will inevitably affect the meaning and use of these findings in a local context. Moreover, combining the findings reported here about undergraduate students with ECAR's findings about faculty, this report series can help institutions gain a better understanding of IT on campus in relation to many aspects of institutional operations. This report should therefore be seen not as the end of the discussion about student use of IT on campus, but only the beginning.

Key Findings

- **Students rated their overall campus technology experiences favorably.** Ratings of wireless network performance are highly correlated with the positive experiences students have with technology. Wi-Fi in outdoor spaces was the only item that students rated more negatively than positively.
- **When it comes to meeting technological support needs, students' default modality is DIY.** Students are more than twice as likely to figure out solutions to technology problems on their own, to search online sources, or to ask a friend than they are to use their campus help desk. Contacting the vendor or company to fix a technology problem is the last resort.
- **Students are remarkably savvy about keeping their technology secure.** An overwhelming majority tend to secure their devices with passwords and PINs, using complex password protocols. Most students reported not sharing their devices and accounts with others, and only 1 in 10 have had devices stolen or accounts hacked in the past year.
- **Laptops are king, smartphones are queen, and tablets are on the way out.** At least 19 of 20 students own a laptop or a smartphone, and 3 in 10 students own a laptop, a smartphone, *and* a tablet. Students view their laptop as critical to their academic success, and three-quarters of students said their smartphone is at least moderately important. Tablets appear to be in decline in terms of ownership, utility, and importance, in part because their functionality is duplicated by a combination of laptops and smartphones.
- **Students' experiences with their instructors' use of and approach to technology in the classroom are a mixed bag.** A majority of students said most of their instructors have adequate technology skills, use technology to enhance learning, and encourage the use of collaborative technology tools. However, students said fewer faculty use technology for sophisticated learning tasks (e.g., engagement, creative and critical thinking), and relatively few faculty ask students to use their own devices for in-class work.
- **Students are overwhelmingly pleased with the student success tools available to them.** At least 80% of students think that every student success technology we asked about—from degree audit, planning, and mapping tools to early-alert systems, self-service tools, recommendations for courses, and suggestions about academic resources and about improving performance—is at least moderately useful.
- **Students are choosing sides in the online versus face-to-face debate.** For the fourth year in a row, the number of students preferring a blended learning environment that includes some to mostly online components has

increased. The number of students preferring completely face-to-face or completely online courses continues to dwindle. The number of students expressing no preference has been cut by more than half since 2014.

- **Students are satisfied with features of their LMS...except when they aren't.** Students have favorable opinions about the basic features and functionalities of their LMS. But, the more sophisticated the task and the more engagement required of students, the less happy they tend to be. This may be a function of the tools, the instructors who use them, or both.
- **Students would like their instructors to use more technology in their classes.** Technologies that provide students with something (e.g., lecture capture, early-alert systems, LMS, search tools) are more desired than those that require students to give something (e.g., social media, use of their own devices, in-class polling tools). We speculate that sound pedagogy and technology use tied to specific learning outcomes and goals may improve the desirability of the latter.
- **Students reported that faculty are banning or discouraging the use of laptops, tablets, and (especially) smartphones more often than in previous years.** Some students reported using their devices (especially their smartphones) for nonclass activities, which might explain the instructor policies they are experiencing. However, they also reported using their devices for productive classroom activities (e.g., taking notes, researching additional sources of information, and instructor-directed activities).

Student Technology Experiences

Students are arguably the single most important group of end users of the technologies that IT units develop, implement, and/or support. If the students are not happy with their campus technology experiences, then no one in their corresponding IT units should be happy. The good news is that students continue to think that IT units offer them quality technology experiences on their respective campuses. In 2017, more than three-quarters (78%) of students reported having either good or excellent overall technology experiences, a number that is similar to the 80% we observed in 2016.¹ Less than 10% of students said their overall technology experiences are negative!

Experience with Wireless Networks

Maslow's hierarchy of needs emphasizes certain human needs (e.g., physiological needs for food, clothing, shelter) that must be met before other, more complex needs (e.g., safety, love and social belonging, self-esteem, and self-actualization) can be satisfied. Recently, that hierarchy has been cheekily updated to include Wi-Fi as a need that must be filled before any other needs can be met. Indeed, Wi-Fi may honestly be somewhat necessary for some to even find food, clothing, and shelter. Given the relationship between students' ratings of wireless networks and overall student technology experiences, there may be some truth to this popular meme.

We do know that students' overall experience with technology on their campuses is, in part, a function of their interactions with the wireless infrastructure and campus networks.² A majority of students reported good to excellent experiences with the Wi-Fi in campus libraries (76%), classrooms (68%), general indoor public spaces (61%), and dormitories and student housing (51%) (see figure 1). But with almost half of students reporting subpar experiences in outdoor spaces, and nearly one in three students reporting subpar experiences with dormitory Wi-Fi (32%) and network performance (30%), IT organizations still have some work to do.

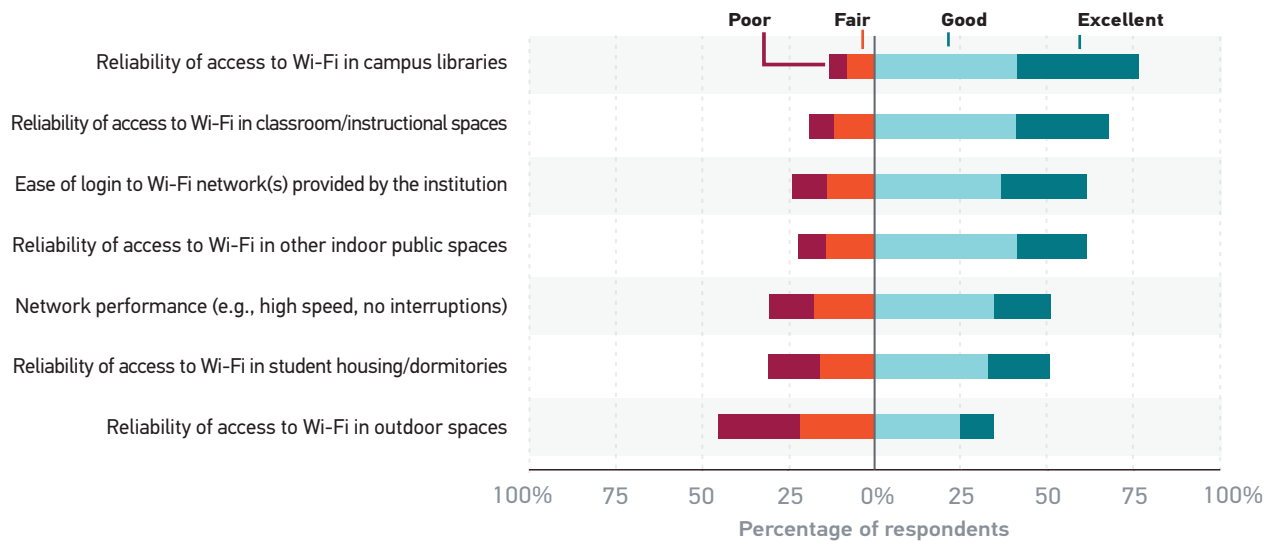


Figure 1. Student experiences with wireless networks

Limiting bandwidth in dormitories because students may be using the Internet for nonacademic purposes (e.g., streaming media, online gaming) punishes students who need robust wireless networks to conduct the business of being a student; it also ignores the fact that a student's dormitory is a home away from home and that some creature comforts can support the whole student. Moreover, in an era when physiological needs may have been replaced by Wi-Fi at the base of Maslow's hierarchy, institutions desiring to provide students with the best possible technology experiences should invest in increasing the capacity of their infrastructure in the places and spaces where students are giving them low marks.³

Technical Support

When there's something strange in your CPU, who you gonna call? Assuming a Class 5 Ecto-Clone is not actually haunting their laptops, then one might expect students to call the campus computer help desk for technical support. Students, however, take quite a different approach to fixing problems they have with their computing devices. Indeed, only a quarter (25%) of students include the college/university help desk services among their top 3 choices (see figure 2). Instead of seeking assistance from experts, students' top 3 choices for technical support reflect a DIY approach: They figure out solutions to their problems on their own (63%), search online resources such as Google and YouTube (62%), and/or simply ask their friends (51%).⁴ These behaviors match well with efforts to teach students as early as kindergarten and first grade⁵ to become independent problem solvers,

especially when it comes to troubleshooting technology.⁶ The drop between students' primary and secondary sources of IT support is precipitous: Students are about half as likely to seek expert help from the help desk service (25%) and instructors (25%) as from their least frequent informal source. This pattern is even starker when compared with the magnitude of faculty who seek out the expertise of the help desk first, followed by themselves, the Internet, and their peers.

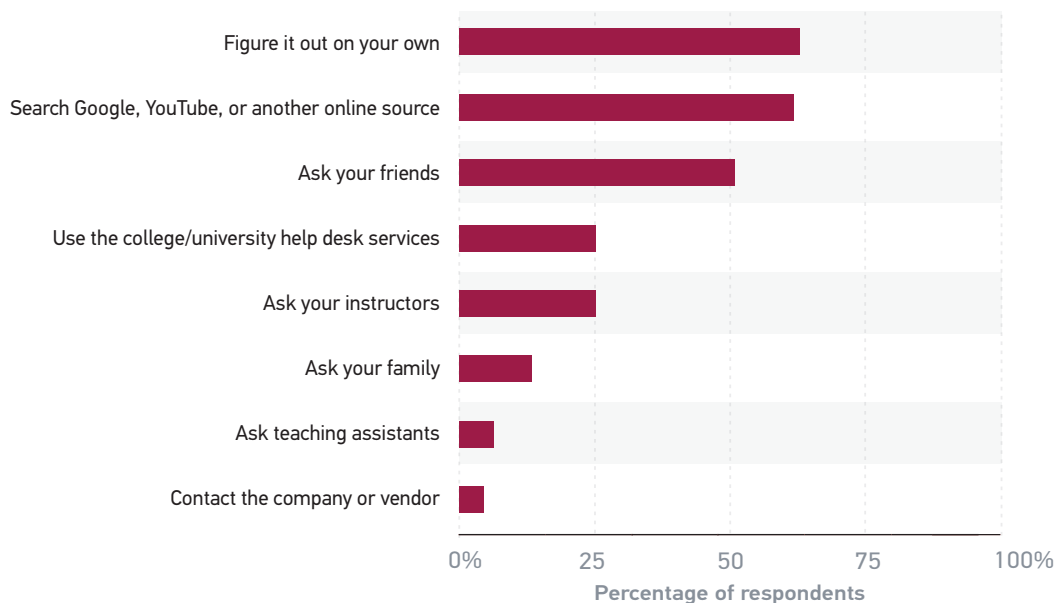


Figure 2. Where students turn for technology support or assistance

Why is it that students eschew the technological expertise of the campus help desk in favor of doing it themselves or asking their friends? It certainly is not because they are digital natives and know everything there is to know about technology. Beyond the sheer balderdash of such an argument,⁷ our research has demonstrated previously that there are not really that many differences between today's students and their instructors in terms of how they use, relate to, and think about digital technology.⁸ It could be that students are novice learners who simply grab whatever information is available at their fingertips regardless of whether the information acquired is correct or efficiently obtained.⁹ More generously, maybe students see technology problems as opportunities to learn something for themselves via trial and error or online research, or they may have networks of friends who can teach them how to solve the problem. Less generously, help desks may be generally inhospitable to students and their needs (e.g., too long to get resolution of ticket; unaware of availability of services; a perception that help desks are mainly for faculty and staff; open only during

business hours). Perhaps the spatial proximity of and access to potential sources of help—do it myself, look up what others have done, ask a roommate or peer down the hall, then call the help desk—shape the choices students make. Or, maybe calling the technology help desk simply is not the cool thing to do.

The truth is, we simply do not know why the campus technology help desk services that practically all campuses offer are not being used by students as much as we might expect.¹⁰ Understanding this phenomenon should be important for campuses that find their technology support services underutilized by students. Leveraging ticketing systems and other sources of analytics related to the help desk to better meet student demands for technology support would be a good start. Additionally, IT units (perhaps in conjunction with centers for teaching and learning) can deploy a brief questionnaire to better understand students' reasons for not using the technology support services offered.

For instructors, staff in centers for teaching and learning, and others who interact frequently with students, consider pushing IT resources to students in assignments, syllabi, and other materials to help them think about how to find correct answers to their problems more efficiently than by trial and error, sifting through thousands of DIY sources, and/or asking a friend down the hall.

Information Security Practices and Training

For the second year in a row and the third time since 2008,¹¹ information security is first on the list of the EDUCAUSE Top 10 IT Issues, highlighting the urgency with which institutions need to consider “developing a holistic, agile approach to reduce institutional exposure to information security threats.”¹² Providing students with information security training should be an obvious part of any higher education strategy to mitigate potential vulnerabilities. Very few students, however, said that their institution provides either mandatory (4%) or optional (10%) information security training; about twice as many students (26%) said no information security training options are available to them. Perhaps more worrisome is that about 60% of students simply do not know whether information security training is available to them on their campuses. Of those students with access to training, only about a third (32%) participated during the past year, but nearly all of those who did participate (88%) found it to be at least moderately useful.

There are some discrepancies between what information security training students report is available and what institutions claim to provide. According to data from the 2015 Core Data Service (CDS), more than a quarter of institutions provide some sort of mandatory information security training for their students, most of which focuses on acceptable use policies.¹³ Regardless of these differences, the fact remains that students are comparatively overlooked by campus information security efforts. For example, a majority of colleges and

universities have mandatory information security training for staff and/or faculty that often moves beyond usage policies to cover regulatory compliance, security policies, and self-defense tactics.¹⁴ Institutions likely focus their information security training resources on faculty and staff for at least two basic reasons:

1) The cost associated with training students, who clearly outnumber faculty and staff, is considerable; and 2) even though the sheer number of students (and their devices) increases the possible points of institutional vulnerability, students do not have access to the confidential, private, and restricted information that staff and faculty need to protect.

Despite the lack of institutional training provided for students (or the lack of students' *awareness* of training opportunities), students do appear to be pretty savvy with respect to information security issues. Indeed, overwhelming majorities of students reported technology habits that suggest that they take information security seriously (see figure 3).

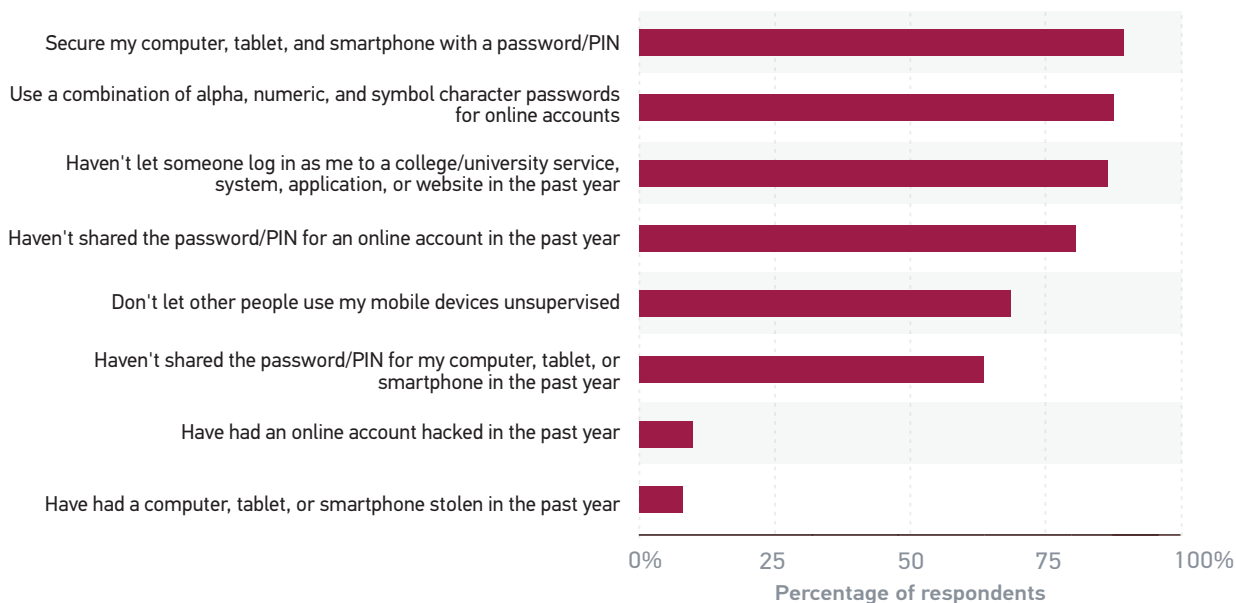


Figure 3. Students' information security hygiene

Given that there is almost always room for improvement, we offer the following recommendations:

- Increase the number and type of security training options available to students.
- Explore online options as a cost-effective means to provide information security training at scale.

- Advertise training programs better to raise awareness of options to students for existing (or future) training opportunities.
- Expand student security training beyond usage policies.
- Make campus information security resources more visible to students.
- Consider the impact of two-factor authentication or simpler alternative password protocols¹⁵ on the quality of the information security regime and the long-term campus security culture.

These actions can help cultivate a culture of security on campus and promote long-term information security that will provide students with the skills and knowledge necessary to protect themselves (and their employers) once they graduate.¹⁶

Device Ownership

Students continue to own a considerable number of digital technologies (see figure 4), with nearly all students having more than one device and roughly a third each owning two, three, and four or more. Despite near market saturation of smartphones and laptops, the percentage of students who own those devices continues to increase! Compared with 2016 data, students' smartphone ownership increased one percentage point to 97% and laptop ownership crept up two points to 95%. Although about half of students own tablets, our data suggest that the tablet market for students may be shrinking; not only did we see a seven-point drop in ownership since 2016, but also 90% of those who do not own a tablet told us that they have no intention of purchasing one. For the first time in a couple of years, we asked students about desktop computer ownership. About 3 in 10 students continue to own a desktop, but 7 in 10 do not and do not plan to own one.

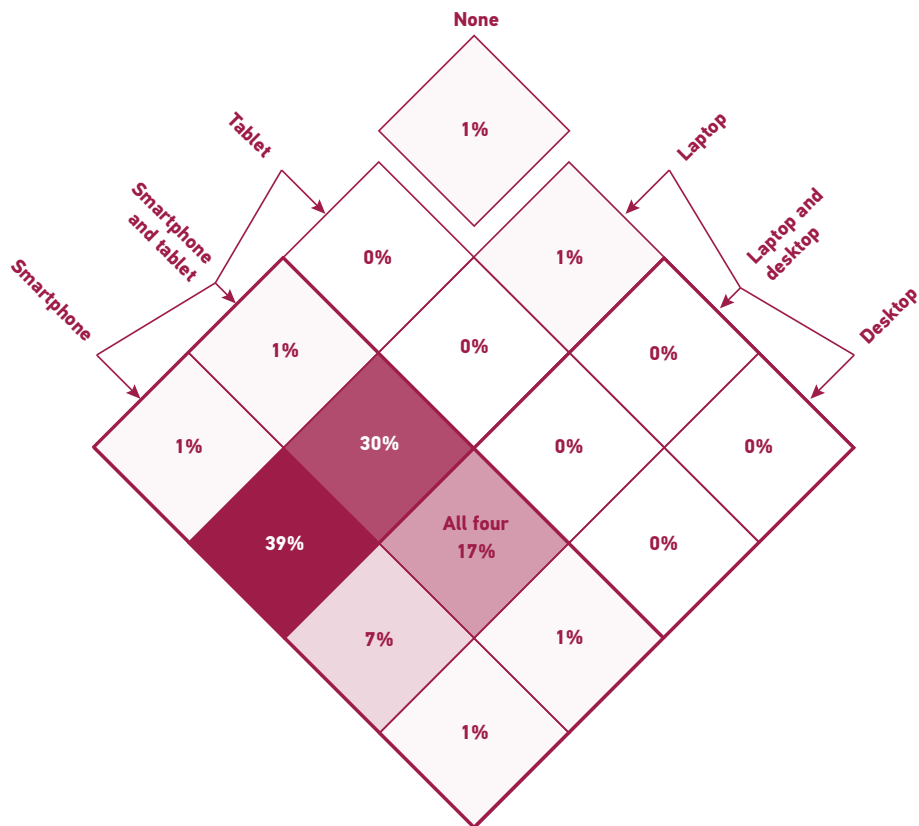


Figure 4. Student smartphone, tablet, desktop, and laptop ownership

One of the clearest themes that emerged from these data is that student ownership of digital technologies is converging on two devices: laptops and smartphones. Laptops, as we know well, are the academic workhorse of the modern college and university student.¹⁷ And, although the ubiquitous smartphone is not used as much for academic work as the laptop (see figure 5),¹⁸ about three-quarters of students (78%) consider their phones to be at least moderately important to their academic success. That both of these devices are used and viewed as important by students may be a product of their functionality; that is, laptops handle the heavy lifting of student work (e.g., composition, statistical analysis, graphics), while smartphones are conducive to more agile tasks (e.g., communication, easy information access, photography). Tablets, which lie somewhere in between—not as powerful as laptops, not as agile as smartphones—appear to be falling from favor. The attractiveness of tablets’ touchscreen capabilities are now being challenged by similar technology in laptops; from the other end, the allure of larger screen sizes on tablets may be diminishing as the size of smartphone screens increases.

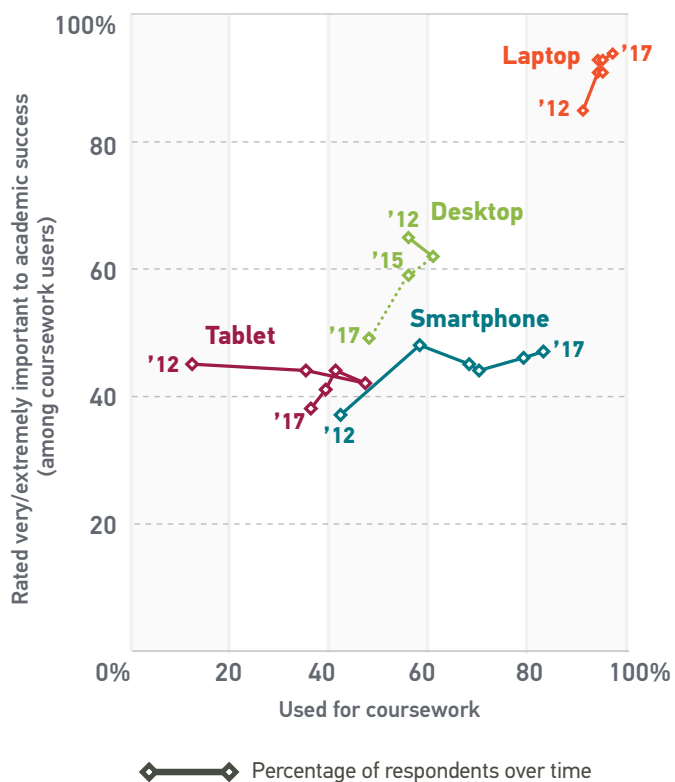


Figure 5. Relationship of device used for coursework with importance to student success

What should we make of all of this? For institutions that supply devices for in-class activities, laboratory exercises, and/or training, it might be worthwhile reconsidering investments in tablets, as laptops are seen as more useful and important to student success. This does not necessarily mean that institutions should completely divest themselves of providing (or even supporting) tablets; instead, we recommend striking a balance between laptops and tablets that fits institutional budgets, faculty and departmental needs, and student demands. For the 52% of faculty who ban or discourage the use of smartphones in the classroom, stop it. Although about 40% of students confess to using their smartphones for off-task activities, only 18% do not use them for *any* on-task activities. And indeed, what faculty member can truthfully claim to never having used a laptop or smartphone for off-task activities in a faculty or committee meeting? Our data also suggest that students who use their smartphones purposefully to do things like taking notes or participating in instructor-directed activities are less likely to use them to engage in nonclass activities. If students are to learn how to become independent learners and thinkers, instructors need to abandon the *in loco parentis* posture, overcome the fear of being wrong or “looking stupid” in the classroom,¹⁹ and adopt proven student-centered pedagogical approaches²⁰ such as active learning²¹ that deliberately leverage and incorporate the learning tools students carry with them.

Opinions about Faculty and IT Tools

Instructor Technology Experiences

Because the choices instructors make about using technology in their teaching shape students' overall technology experiences,²² we asked students how many of their instructors use technologies in various ways (see figure 6). For at least the third year in a row, we have obtained largely similar results in terms of both relative and absolute percentages. First, a majority (65%) of students told us that at least most of their instructors use technology adequately for instruction, use technology during class to make connections to the learning material or to enhance learning with additional materials (55%), and encourage students to use online collaboration tools to communicate/collaborate with the instructor or other students in or outside class (50%). Although there is a slight downward trend over the past three years for these three items,²³ they have maintained their ranking relative to one another. At the bottom of the list of items for which we have longitudinal data are student responses about whether faculty encourage them to use their own devices to deepen learning; only 29% of students said that most to all of their instructors are embracing bring your own everything, or BYOE,²⁴ to advance learning outcomes in 2017 compared with 34% in 2016 and 35% in 2015. Indeed, a majority of students said that few to none of their instructors ask students to use their own smartphones (58%) or tablets (65%) as learning tools in the classroom; a plurality of students said that most or all of their instructors ask students to use their own laptops (38%), about the same proportion who said that few to none of their instructors do this (34%).

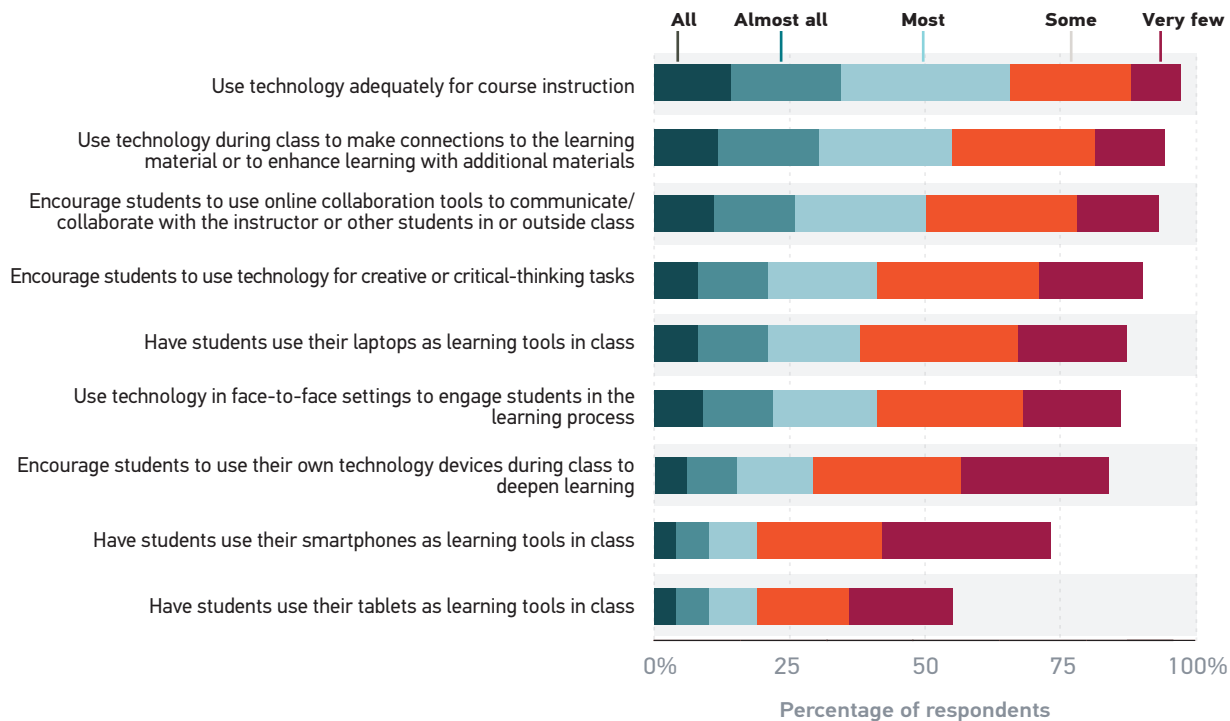


Figure 6. Faculty use of technology as a means to engage students

In addition to the relative stability of student reports of faculty use of technology over time, there is also a fairly clear difference between the kinds of things instructors are doing with technology. One group of practices tends to be focused on enhancing the instructors' abilities, their pedagogical approaches, and the purposeful use of technology to accomplish course-related tasks. The other group of technology experiences students have with their instructors is related to the use, or lack thereof, of their devices. Student and faculty reports of instructors banning or discouraging the use of devices are well documented²⁵ and are tied both to concerns about digital distractions and control of the classroom.

Given recent data, the evidence suggests that it might be easier to teach an old dog a new trick than to convince faculty that pedagogically sound use of digital technologies can enhance student learning experiences. Certainly, we have evidence that many instructors are using technology for basic instructional purposes, but the lack of encouragement for students to use their own devices to deepen learning is a thorny problem for which there is no easy solution. If faculty say that evidence of the impact of technologies is what they need to change how they teach with them (and they do²⁶), then it is incumbent on IT organizations and centers for teaching and learning to curate evidence for (and against) the use of different types of educational technologies. Furthermore, we also know that

many faculty believe that incorporating technologies could make them better instructors if they knew how to better integrate them into their teaching.²⁷ To help instructors embrace the changes to the learning environment that have been looming on the horizon, we recommend institutions do the following:

- Provide instructors with opportunities for both technology training (IT units) and examples of good practices of teaching with technology (especially when they come from peers).
- Adopt professional development models that encourage the thoughtful wedding of technology and pedagogy that can facilitate larger institutional changes. Such an approach would move beyond basic technology training models to feature good practices; offer learning communities; incorporate mentoring by experts; respond to various levels of skill, knowledge, and expertise; acknowledge that teaching is experimental and iterative; and evaluate outcomes.²⁸
- Change the institutional parameters of tenure, review, and promotion so that excellence in teaching and pedagogical innovation is rewarded.²⁹

Student Success Tools

Being a college or university student is hard. Studying is hard. Time management is hard. Keeping track of your course requirements is hard. Remembering deadlines is hard. Getting answers to questions, seeking advice, and finding resources are hard. Doing your own laundry is hard (unless a parent/guardian/maid does it for you). Studying while holding down a job and/or caring for a family is really hard! Nearly a decade into the analytics revolution, we are beginning to see ways in which digital technologies are helping students succeed. True, there's no app to sort your lights from the darks or fold your shirts,³⁰ but the host of student success tools available to many undergraduate students are considered at least moderately useful by four out of five students (see figure 7). The most useful student success technologies (with at least 60% of students saying they are very or extremely useful) are designed to facilitate students' management of their academic careers: degree audit tools that show the degree requirements completed, degree planning or mapping tools that identify courses needed for degree completion, and online self-service tools for conducting student-related business. Although students deem them slightly less useful, the remaining items in figure 7 appear to be related to more academic issues and resources at the course level (e.g., early-alert systems, course guidance, performance improvement) or the personal level (e.g., record-keeping, resource recommendations).

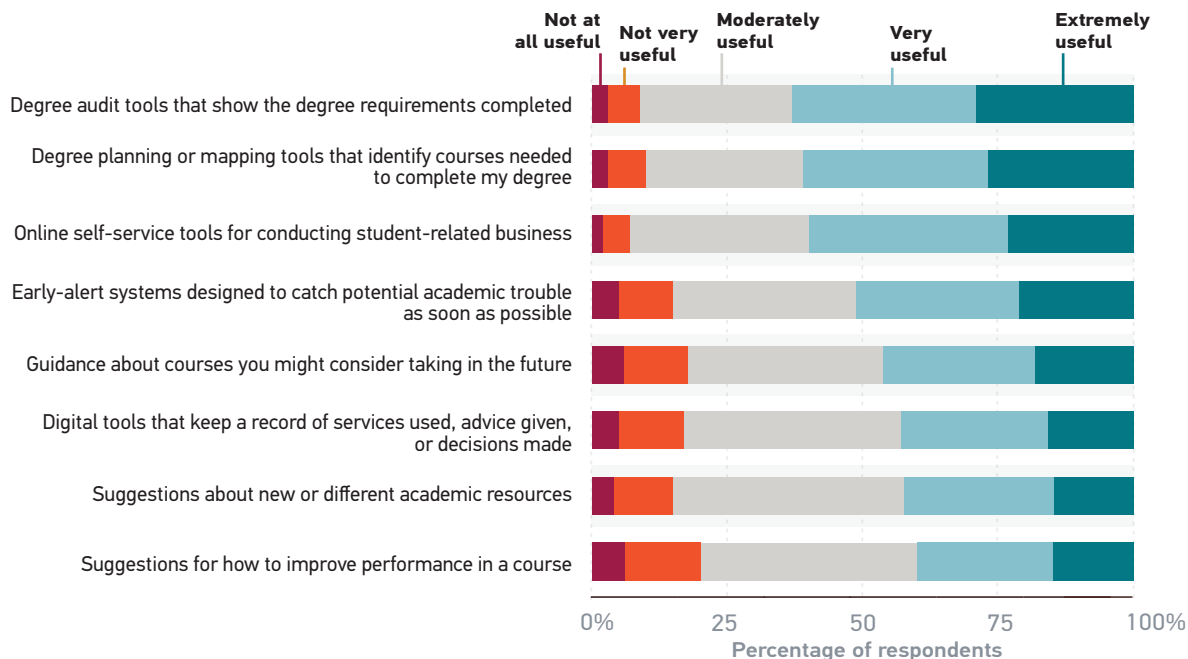


Figure 7. Student evaluation of student success tools

Clearly, student success technologies are seen as useful because they mitigate or moderate some of the things that make being a student difficult. That said, these technologies are more useful to some students than to others. Specifically, students who may possess structural (e.g., ethnicity, gender), socioeconomic (e.g., class), or other circumstantial (e.g., first-generation college student) disadvantages find student success tools more useful than students more advantaged in these areas. Women and students who are eligible for Pell grants (a measure of financial need) are slightly (but statistically significantly³¹) more likely to find all of the student success tools about which we asked more useful than do men or non-Pell-eligible students. First-generation and black or Hispanic students find all of the student success tools—except degree audit and planning tools—to be more useful than non-first-generation and white students. While student success tools appear to benefit nearly all students who have access to them, they also appear to give a leg up to those who may need them the most.

What steps can IT units take to make sure that students on their campuses have access to student success tools? Well, these tools—often referred to as integrated planning and advising for student success (iPASS)³² or student success management technologies—were named one of the top strategic technologies by EDUCAUSE for the first time in 2017. Driven by mandates for student success

initiatives and data-driven decision making, iPASS technologies are fully deployed at only a handful of institutions, but larger numbers of institutions are beginning to track and learn about them. One thing we do know is that student success projects are not just IT projects—they are projects that require buy-in from stakeholders across the institution including, but not limited to, advising, student affairs, registrar's offices, institutional research, counseling, academic affairs, faculty, and, of course, students.³³ Student success should be the goal of every institution of higher education. If student success technologies make earning a degree or credential easier (as students tell us they do), then deciding to provide them should not be a hard decision at all.

Learning with Technology

Learning Environment Preferences

Resistance is futile. Students' preferences for courses that assimilate both face-to-face instructional components with technological features of the online environment continue to gain momentum across higher education. For the fourth year in a row, the number of students preferring a blended learning environment has increased (see figure 8). For 2017, the percentage of students preferring courses that incorporate online components for some, half, or most of their courses is 79%, an increase of five percentage points since last year. The percentage of students resisting the blended trend and preferring either fully online courses or fully face-to-face courses continues to decrease (by one percentage point each), albeit slightly. Finally, students residing in the neutral zone—those who express no preference for their learning environment—appear to be rapidly diminishing in number, losing a full one-third of their population since 2016.

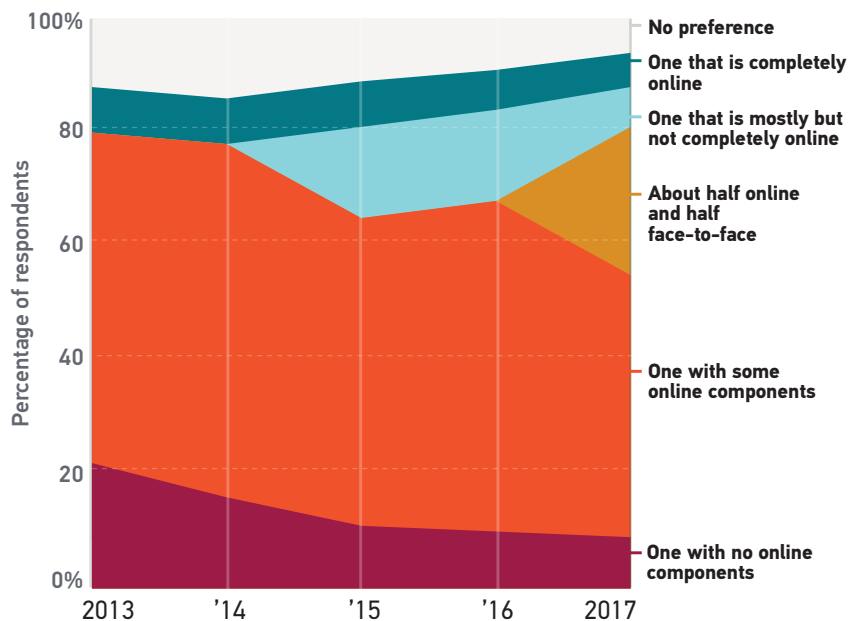


Figure 8. Students' preferred learning environments

Why do students prefer a particular learning environment over another? Last year we found that one of the key determinants of student learning environment preferences was whether students had taken courses in those respective learning

environments in the previous year.³⁴ This year we asked students about the learning environments in which they think they learn best and found that this opinion is highly and significantly associated with learning environment preferences, too. Controlling for having taken courses in particular learning environments, we found that students prefer the modality in which they think they learn best, with the exception of fully face-to-face courses. Students who think they learn best in completely face-to-face courses actually are slightly more likely to prefer one with some online components than they are a completely face-to-face one.³⁵ While this latter point may be an indication of student culture adapting to the service of online course components, student preferences for and beliefs about the efficacy of blended learning may be reflecting what research continues to tell us: Blended learning as a modality of instruction and learning is superior to either fully online or fully face-to-face.³⁶ Indeed, new research supports this, especially when the technology serves as a catalyst for changing both what faculty teach and how they teach.³⁷

The empirical evidence strongly suggests that blended learning conditions (where at least a quarter of course content is delivered online) produce significant gains in student learning. It also suggests that the overwhelming majority of students both prefer blended learning environments and believe they learn best in them. This is the evidence faculty say they require to embrace educational technologies.³⁸ Barring the introduction of Borg nanoprobes, how might instructors then take this evidence and put it into action? Generally, abandoning a lecture-based, instructor-centered pedagogy for a student-centered, active learning one might be a good start. Working closely with instructional designers and technologists can facilitate this transition and help identify opportunities for the incorporation of technology into teaching. To the degree that digital technologies can increase flexibility in classroom activities, can give students room to explore, and can engage them in active problem solving, instructors should embrace those technologies. This should be especially true when blended techniques and technologies can be combined with active learning classroom spaces and flipped classroom models for the face-to-face components.³⁹ The structural and technological conditions that make such approaches possible are here and not going anywhere anytime soon; the shifts in pedagogical approach may lag, but they will come. Resistance is futile.

LMS Satisfaction

The learning management system (LMS) is higher education's Swiss Army knife. It is a multitool available to (nearly) every student. It is designed to be versatile, practical, and easy to use and comes with any number of useful features, many of which are rarely or never used (at least well) because users don't know what they are or should be used for (e.g., marlinspike), never really have the opportunity

to use it (e.g., hoof cleaner), and/or have other, better options available (e.g., toothpick). When we compare student satisfaction levels with various features of the LMS, a clear division between the basic tools of an LMS and its more sophisticated features becomes apparent (see figure 9). A majority of students are either satisfied or very satisfied with the basic functions that they are able to perform within their LMS—submitting assignments (77%), accessing course content (75%), checking course progress (66%), managing assignments (62%), and receiving feedback on assignments (59%). The more complicated the task or assignment and the higher the level of engagement required, the lower the level of student satisfaction with the LMS—engaging instructors (54%), accessing institutional information (54%), engaging with other students (49%), collaborating on projects (43%), and participating in study groups (40%). It’s not that students actively dislike these latter LMS functions (none of them have more than 20% dissatisfaction rates) so much as they are “meh” about them. Indeed, a plurality of students ticked the neutral option for the bottom three activities, suggesting that no more and no less would suit them just fine.

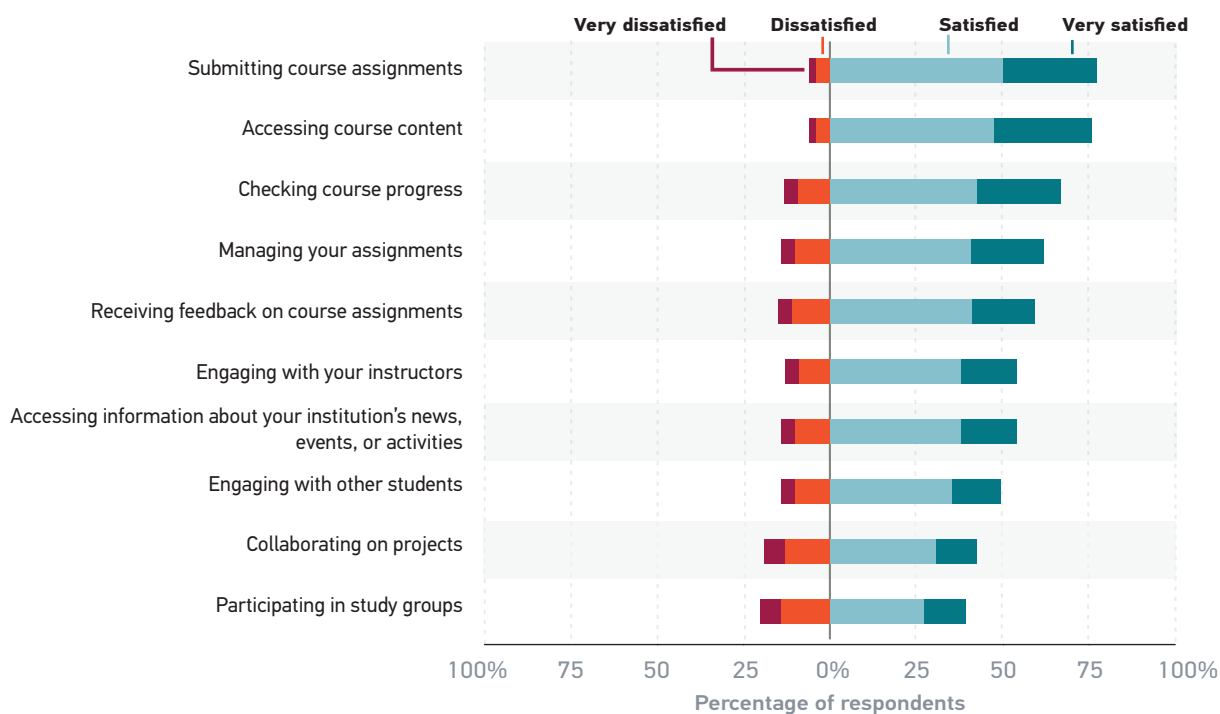


Figure 9. Students’ evaluation of learning management system features

Although it might be tempting to blame the lower satisfaction levels of the more advanced functionality of the LMS solely on the users, the ways in which the LMS is used as a learning tool are probably responsible for these

lower satisfaction rates. Certainly, instructors could do more to better scaffold assignments to engage students, and students could do more to actually engage in the activities designed for them.⁴⁰ Where the LMS falls short as a learning tool is that it is a one-size-fits-all system focused on managing processes associated with learning. Higher education needs to move away from a management system to a learning environment that encompasses a host of interactive components that are student centered and “enable learning of all kinds to flourish.”⁴¹ Next-generation digital learning environments (NGDLEs) that address issues of interoperability; personalization; collaboration; accessibility and universal design; and analytics, advising, and learning assessment⁴² are a relatively new concept that is beginning to get some attention and traction in higher education IT circles.⁴³

For NGDLEs to be taken seriously as customizable learning tools that meet the individual needs of instructors and students, technical and cultural obstacles need to be overcome. Addressing the technical aspects of developing open standards for interoperability and methodologically sound applications that harness learning analytics,⁴⁴ while difficult, may be the easier of these tasks. Changing teaching culture so that instructors use more features of the learning environment than just the basic tools (with which they tend to be fairly satisfied) and use them better might be a bit more difficult. IT investment in faculty use of the current LMS to promote best practices and pedagogical scaffolding for online assignments does three things: 1) provides instructors with the ability to design the new tool with features that are the most wanted and needed, 2) allows them to have input on the exclusion of bells, whistles, and hoof cleaners that never get used or used properly, and 3) lays the foundation for future adoption and use of NGDLEs. On the other hand, IT leaders and their organizations need to see NGDLE as more than just another IT project and to cultivate the alliances and partnerships across the university that will engender buy-in and cooperation to render new tools that are practical, customizable, and effective improvements to teaching practices and learning outcomes.

Technology (What Students Want)

The best things in life are free, but students want technology. That’s what they want. And they want their instructors to use more (most) of it in their courses. And rational self-interest is the primary determinant of which technologies they prefer. Once again, we asked students what resources/tools they wish their instructors used less and more, and they told us that regardless of the resource/tool, on average, they want more of it. When we look more closely at the data, however, we see that not all technologies are equal in the eyes of today’s undergraduate students. With the exceptions of students’ tablet use, e-portfolios, and social media, greater proportions of students wanted *more* use of particular tools and resources than *less* use (see figure 10). Students’ most

desired technologies are lecture capture technologies, OER content, early-alert systems, and the LMS, all of which have quadruple the number of students who want more use of these technologies than less.

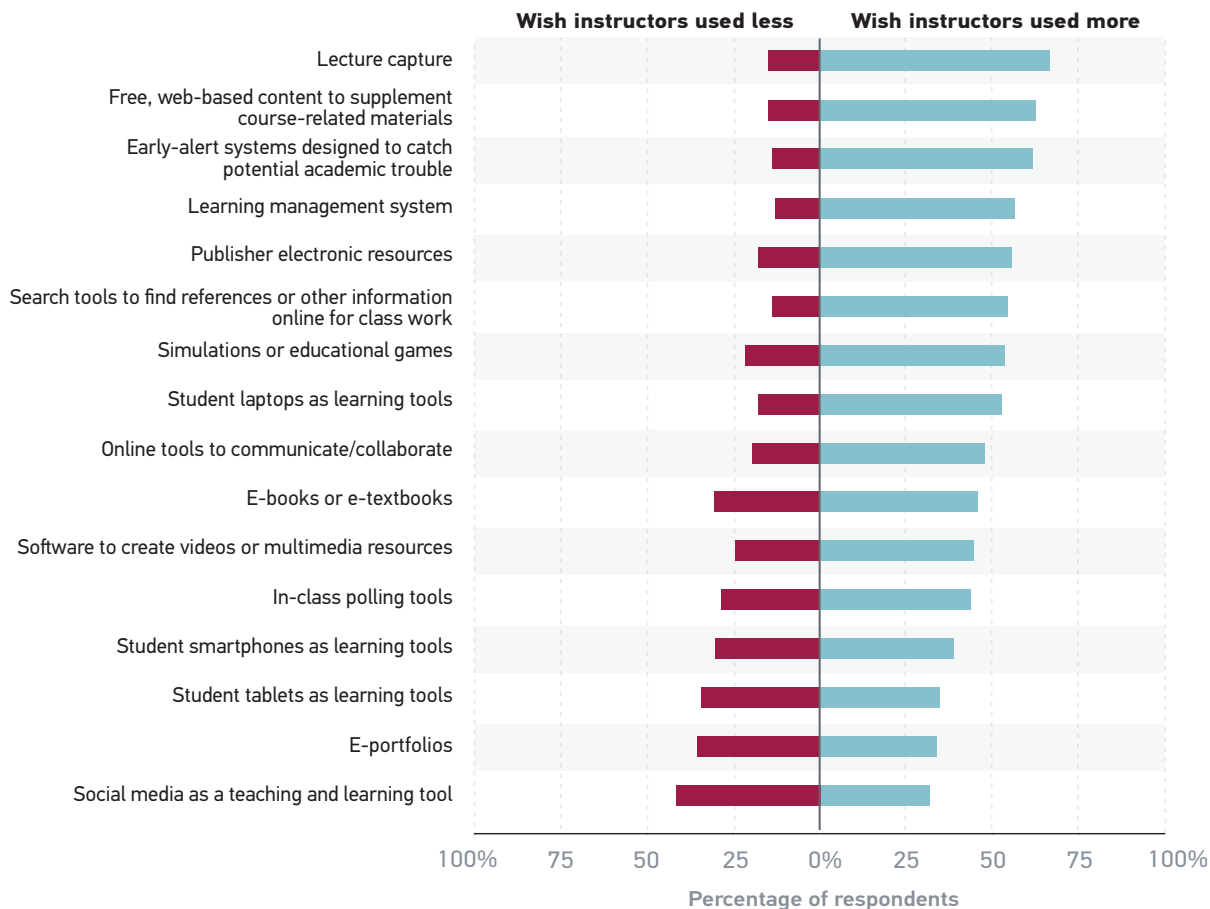


Figure 10. Technologies that students would like their instructors to use more (and less)

On the surface, the reasons behind these preferences are not entirely clear. A deeper analysis of the data, however, reveals that there are two families of technologies drawn along fairly unusual lines of taking and giving. The first group—students’ laptops, tablets, and smartphones; simulations/games; polling; e-portfolios; and social media—seems to “take” from students in that these technologies require students to either use their private devices and accounts or produce content for the consumption of others. Unless faculty clearly and openly state the pedagogical benefits of using these technologies to enhance content, context, and learning expectations, students may be less enthusiastic to engage in these kinds of activities.⁴⁵ The second group—including lecture capture,

OER materials, early-alert systems, search tools, publisher resources, online collaborative tools, video/multimedia software, and electronic texts—seems to focus on technologies that “give” something (e.g., content, information, help, guidance) to the student. Students would like to see greater use of technology that helps them do the work of being students—that is, getting information and getting stuff done. In the simplest terms, students generally prefer technologies that provide immediate and clear benefits.

How should technology professionals, teaching and learning professionals, and instructors proceed with this information? In specific, we recommended faculty avoid even the appearances of the “creepy treehouse” by refraining from building assignments that require students to use their personal social media accounts.⁴⁶ As should be the case with *any* technology, the use of social media should be accompanied by a clear pedagogical goal and should give students the option of using a dummy account for the purposes of the course. The utility of e-portfolios of student work beyond the individual course or major program needs to be assessed and evaluated by those who assign them;⁴⁷ likewise, simulations and games that are not tied clearly to learning outcomes should be avoided. We can’t get behind abandoning the use of student devices for classroom activities and exercises—the practical and financial benefits of BYOE are real and need to be embraced more by both faculty and students. Furthermore, avoiding the use of polling technologies simply because some students want less of them (especially if we don’t know why they don’t like them) is an untenable position, particularly when there are so many good examples of how clickers and other devices can be employed effectively.⁴⁸ Finally, embrace, support, and use deliberately the technologies that students desire more use of and avoid the temptation to adopt a posture of *in loco parentis*, deciding what is best for students. They often know what technology can get them. And, while technology don’t get everything, it’s true, what it don’t get, students can’t use. Just give them technology.

Uses, Abuses, and Consequences of Classroom Device Use

Breaking news! Students report the most hostile postures from faculty toward student devices in the classroom in years! Faculty are banning or discouraging the use of all types of devices in the classroom more than in recent years! And some devices are the object of instructor ire more than others! Stay tuned to find out how far out of favor your favorite classroom device has fallen from the ivory tower! Now, here’s Tom with the weather.

Actually, there is not much “breaking” about this finding. Smartphones continue to be the most despised technologies among instructors, with 70% of students saying their instructors ban (23%) or discourage their use (47%) in class (see figure 11). What does qualify as news, however, is that these numbers represent the reversal of a downward trend over recent years in the restrictions faculty

place on smartphones.⁴⁹ Similarly, the percentage of students who said their instructors are restricting the use of tablets in the classroom also has risen, from about 25% in 2015 to 40% in 2017. The only contrary outcome appears to be that the percentage of students who say their instructors encourage or require laptop use in class is up, from 30% in 2015 to 35% in 2017.

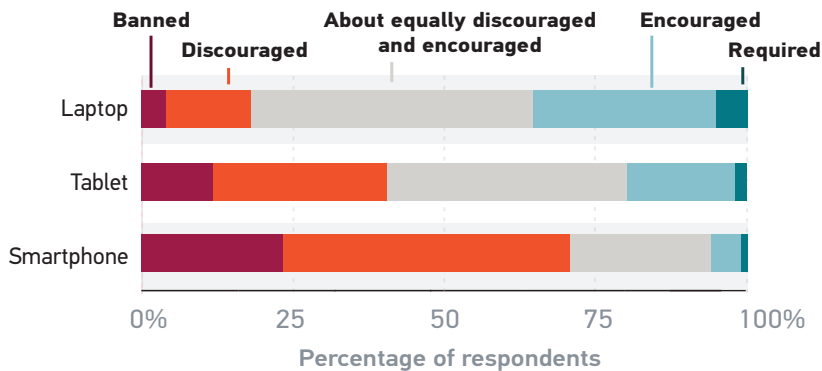


Figure 11. Students' in-class experiences with their devices

What turn of events can help us understand why fewer faculty—at least according to students—appear willing to harness the power of mobile devices in the classroom? At least three plausible reasons emerge. First, there is evidence that device usage in the classroom may undermine student performance in their coursework.⁵⁰ While there are some solid pieces of research supporting restricted device use to improve student performance,⁵¹ the evidence is neither conclusive nor ubiquitous and therefore doesn't warrant full-fledged bans; confirmation bias may be playing a role in faculty decisions to ban or discourage devices. Second, instructors might believe that students are using their devices for nonclass activities significantly more than students say they do this, and faculty might perceive substantive differences in how different devices are used for different classroom tasks (e.g., taking notes, looking up information, participating in assigned activities).⁵² While it's true that some students who have devices at their disposal reported using them for nonclass activities (smartphones, 45%; laptops, 28%; tablets, 11%) and that students readily admit to being distracted by digital technologies,⁵³ they also use all of the devices for a number of class-related activities (see figure 12). And, even though no one really multitasks well (although we can switch tasks at breakneck speeds), stripping students of the technologies that are critical to their work as students is shortsighted at best—we don't, for example, take away notebooks and pens from students because they doodle. Moreover, students with documented disabilities that allow them to use assistive technologies in the classroom might feel singled out, ostracized,

or resented by others who perceive unfair or preferential treatment. Finally, the instructors who seek to ban devices in the classroom may be mired in an instructor-centered pedagogy that reflects the desire to control what goes on in the classroom⁵⁴ or feel the need to have students' attention fully focused on them and their slides or boardwork. Active learning strategies that put the student at the center of the classroom experience and direct students' focus of attention are more likely to be led by instructors who see the value of students' using their devices to enhance or improve their learning experiences.

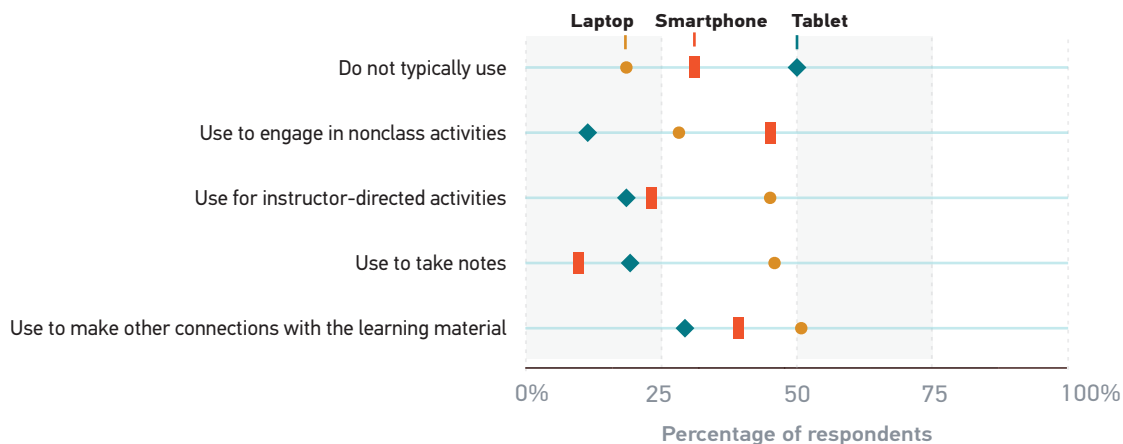


Figure 12. How students say they use mobile technology in the classroom

The brinksmanship between students and faculty over the use of digital technologies in the classroom appears to be getting more intense. Faculty are increasingly banning and discouraging students from using their laptops and smartphones at the same time that those devices are becoming even more important to students' academic success. What is to be done?

- Students:** You need to keep your eyes on the prize. If your devices are as critical to your academic success as you say, when in class use them only for classroom tasks—notetaking, looking up information, engaging in assigned activities, participating in collaborative tasks. Every time your instructor observes you doing something you shouldn't be doing on your device while in class, you are giving your instructor the ammunition to justify banning them altogether. If you know you have problems resisting Pavlovian urges every time you receive an alert, close your applications, turn your devices off, or put them in airplane/sleep mode. You aren't nearly as good at multitasking as you think you are.⁵⁵ Show your instructors that you mean business.

- **Faculty:** Start treating your students with the respect afforded to adults in similar situations by letting them make their own choices and mistakes in the use of digital devices. Treating undergraduate students as children will only engender disdain and contempt for your efforts to help them achieve desired learning outcomes. Instead, develop reasonable policies that respect the practical, diverse, and responsible ways that students use their devices in class. Perhaps work with students to craft policies tailored to the needs of each particular course. Moreover, leverage those opportunities to the benefit of your teaching and the learning of the students in the classroom. Finally, consider whether the use of devices for nonclass activities is a function of disrespect or a lack of engagement. If the former, then certainly such activities should not be tolerated and should be dealt with discretely; if the latter, however, consider the ways in which your pedagogical approach might be limiting students' opportunities to engage with the material, you, and other students and do something to change that. Another option is to have a discussion with students about the use of devices in class and work together on a policy that best meets the needs of both parties. Student technology in the classroom is not going to go away; coming to a resolution on it would certainly be welcome news.

Conclusion

In many ways, the conclusions of this 14th edition of the annual ECAR study of undergraduate students and information technology are the epitome of social scientific research. To summarize: 1) some do, some don't; 2) the differences aren't very great; and 3) it's more complicated than that.⁵⁶ Regardless, the importance of conducting research on the ways in which college and university students are thinking about, using, and experiencing technology in the course of their academic endeavors clearly resides two standard deviations above the mean. The more evidence that can be collected in service of understanding students' technological preferences for and relations to technology, the better equipped faculty and IT organizations will be to meet students where they are. In 2017, students see technology as integral, if not essential, to their academic success. They own it. They use it. They want more of it. Certainly, the degree to which instructional and institutional supplies can and should converge with student demands for technology in pursuit of a fleeting equilibrium is subject to a host of constraints including, but not limited to, costs, pedagogical approaches, evidence of impact, and propensity for distraction. What we need to avoid, however, when thinking about how to introduce technology into the lives of students, are kneejerk reactions grounded in anecdote or single studies that confirm our preconceived biases. We hope that this report and its companion, *ECAR Study of Faculty and Information Technology, 2017*, will serve as the starting point of those conversations.

Recommendations

- Institutions should monitor the loads on their wireless bandwidth, especially in the dormitories, and the coverage of Wi-Fi in outdoor spaces, making upgrades as appropriate. Wireless coverage and reliability are rated highest in the formal academic spaces of campus but may be lacking in the informal learning spaces where students spend the majority of their time studying, playing, and living.
- Evaluate the reach and utility of campus technology help desk services to students and make an effort to understand why such services might be underused. Depending on what one finds, a range of solutions might present themselves including, but not limited to, expanding hours, reducing ticket turnaround times, curating excellent DIY examples, and making help desk services more visible and available.⁵⁷
- Cultivate a culture of information security on campus that promotes long-term cybersecurity hygiene. Students are already pretty savvy about security but could get even better with more frequent and scalable training options, cybersecurity campaigns that raise awareness of issues, prioritization of student security issues beyond usage policies, and improved campus practices (e.g., two-factor authentication, revised password protocols).
- Create faculty development opportunities to help instructors understand how students are and are not using their personal computing devices and develop ways in which they can be leveraged in service to student learning outcomes. The importance of student devices to their academic success is considerable. Helping faculty learn how to augment assignments that harness students' individual computing power could significantly improve student learning and engagement with course materials. Developing faculty communities of practice around teaching with technology can provide both excellent examples and a network of support when experimenting.
- Seize upon student enthusiasm for digital student success tools and partner with institutional stakeholders to build institutional support services around them. When student success tools are integrated into larger student success initiatives that coordinate campus resources, the digital tools for student success can only be more impactful, especially for groups that are traditionally disadvantaged.
- Take steps to make online learning opportunities the rule rather than the exception. At the institutional level, take steps to eliminate differential pricing structures for fully online courses so that they are accessible to

all students. At the program level, consider ways to integrate online and blended courses in the curriculum to meet the learning environment preferences of students (and potentially increase enrollment). At the faculty level, create faculty development programs that help instructors better integrate the LMS into their face-to-face courses, thereby increasing the capacity to produce more blended learning opportunities.

- Begin laying the foundation for the development and adoption of next-generation digital learning environments (NGDLEs). On the technical side, NGDLEs that feature interoperability, personalization, collaboration, accessibility and universal design, and analytics require the development of APIs and open standards that can harness and integrate student success and learning analytics. On the cultural side, investment in faculty training and coaching to better use existing LMS features now will improve the learning experiences of current students, build buy-in for online teaching and learning opportunities, and prepare faculty and students to use and thrive in the NGDLE.
- Curate resources for faculty (and students) that provide evidence of the impact of technologies on teaching and learning, cases of good practices of the use of technology for a range of disciplines, and good examples of managing student device usage in class. Faculty claim that they would use technology more if they had evidence that using it in class works to the benefit of their students. They could also benefit from good examples drawn from the Scholarship of Teaching and Learning (SoTL) to think about ways to better integrate technology into their courses. And, resources to help them understand approaches to student (ab)use of devices in their courses may facilitate classroom policies better than reactionary bans.

Methodology

In 2017, 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 institutions secured local approval to participate in the 2017 study (e.g., successfully navigating the IRB process) and submitted sampling plan information, they received a link to the current year's survey. An institutional representative then sent the survey link to students in the institution's sample. Data were collected between January 30 and April 28, 2017, and 43,559 students from 124 institutional sites responded to the survey (see table M1). 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. Colleges and universities use data from the EDUCAUSE Technology Research in the Academic Community (ETRAC) student and faculty surveys to develop and support their strategic objectives for educational technology. With ETRAC data, institutions can understand and benchmark what students and faculty need and expect from technology. There is no cost to participate. Campuses will have access to all research publications, the aggregate-level summary/benchmarking report, and the institution's raw (anonymous) response data.

Table M1. Summary of institutional participation and response rates

Institution Type*	Institution Count	Invitations	Response Count	Group Response Rate	Percentage of Total Responses	U.S. Percentage
AA	11	62,589	2,169	3%	5%	6%
BA public	19	35,020	1,413	4%	3%	4%
BA private	8	14,112	1,970	14%	5%	6%
MA public	23	150,995	9,560	6%	22%	27%
MA private	13	26,159	2,398	9%	6%	7%
DR public	26	245,026	14,260	6%	33%	40%
DR private	8	19,449	2,808	14%	6%	8%
Specialized U.S.	2	15,558	1,182	8%	3%	3%
Total U.S.	110	568,908	35,760	6%	82%	100%
Outside U.S.	14	116,279	7,799	7%	18%	–
Grand total	124	685,187	43,559	6%	100%	–

* U.S. institutions not in the Carnegie universe were classified according to the Carnegie Classification framework.

The quantitative findings in this report were developed using 35,760 survey responses from 110 U.S. institutions. Responses were neither sampled nor weighted. Comparisons by student type and institution type are included in the findings when there are meaningful differences, and all statements of significance are at the 0.001 level unless otherwise noted. Findings from past ECAR studies were also included, where applicable, to characterize longitudinal trends.

Table M2. Demographic breakdown of survey respondents

	U.S. Institutions	Non-U.S. Institutions	All Institutions
Basic Demographics			
18–24	82%	76%	81%
25+	18%	24%	19%
Male	35%	44%	36%
Female	63%	53%	61%
White	58%	–	–
Black/African American	5%	–	–
Hispanic/Latino	19%	–	–
Asian/Pacific Islander	8%	–	–
Other or multiple races/ethnicities	11%	–	–
Student Profile			
Freshman or first year	24%	38%	26%
Sophomore or second year	22%	23%	22%
Junior or third year	25%	15%	23%
Senior or fourth year	22%	13%	20%
Other class standing	8%	11%	8%
Part time	14%	11%	13%
Full time	86%	89%	87%
On campus	36%	17%	33%
Off campus	64%	83%	67%
First-generation college student	27%	33%	28%
Eligible for Pell grants	37%	–	–

	U.S. Institutions	Non-U.S. Institutions	All Institutions
Academic Goal			
Digital badge(s)	8%	19%	10%
Vocational/occupational certificate	4%	11%	6%
Associate's degree or equivalent	10%	6%	9%
Bachelor's degree or equivalent	80%	44%	74%
Master's degree or equivalent	36%	28%	35%
Doctoral degree or equivalent	14%	10%	13%
Advanced professional degree	10%	6%	9%
College diploma	–	35%	–
Advanced diploma	–	14%	–
Major			
Agriculture and natural resources	2%	1%	2%
Biological/life sciences	9%	4%	8%
Business, management, marketing	14%	21%	15%
Communications/journalism	4%	3%	4%
Computer and information sciences	7%	8%	7%
Education, including physical education	7%	2%	6%
Engineering and architecture	9%	14%	10%
Fine and performing arts	3%	2%	3%
Health sciences, including professional programs	14%	14%	14%
Humanities	3%	4%	4%
Liberal arts/general studies	4%	1%	3%
Manufacturing, construction, repair, or transportation	0%	1%	0%
Physical sciences, including mathematical sciences	3%	3%	3%
Public administration, legal, social, and protective services	2%	5%	3%
Social sciences	9%	6%	9%
Other major	7%	10%	8%
Undecided	2%	1%	2%

Acknowledgments

The amount of effort that goes into producing the ETRAC reports each year is considerable. From planning through publication, the process takes nearly 15 months of close collaboration between EDUCAUSE staff and subject-matter experts (SMEs), requires the coordination of scores of college and university staff, and depends on the goodwill of thousands of students and instructors to take the time to share their experiences with and thoughts about technology in higher education. In this space, we pause to acknowledge the contributions of those who have made the 2017 faculty and student studies possible.

First, we would like to thank the 43,559 undergraduate students and 13,451 faculty who completed the 2017 surveys, giving us the precious data we need to conduct our analyses. Second, we thank the faculty and student survey administrators whose behind-the-scenes collaborative efforts to secure approval to administer the surveys, to create the sampling plans, and to distribute the survey links to the populations are mission critical to this project. Third, we thank by name the five individuals who contributed their experience, knowledge, and time as subject-matter experts and whose feedback, comments, and suggestions throughout the life cycle of this project improved the quality of this report immensely. They are, in alphabetical order,

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- Christopher S. Rice, Principal Consultant, Christopher S. Rice Consulting;
- Richard A. Sebastian, Director, OER Degree Initiative, Achieving the Dream, Inc.; and
- David Andrew Wicks, Associate Professor and Chair of Digital Education Leadership, School of Education, Seattle Pacific University.

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Appendix: Participating Institutions

Abilene Christian University	Idaho State University
Adams State University	International Medical University (Malaysia)
Appalachian State University	Joliet Junior College
Arcada University of Applied Sciences	Juniata College
Arcadia University	Kenai Peninsula College
Auburn University	Koc University
Brazosport College	Kodiak College
Bridgewater State University	Lappeenranta University of Technology
Broward College	LeTourneau University
Brown University	Lipscomb University
Butler University	Louisiana State University
California State University, Channel Islands	Loyola Marymount University
California State University, Chico	Marist College
California State University, Northridge	Marshall University
Case Western Reserve University	Matanuska–Susitna College
Central Connecticut State University	Messiah College
Chadron State College	Michigan State University
Chatham University	Middle East Technical University
Clemson University	Montana State University
Coconino Community College	Montgomery County Community College
College of Wooster	Muskingum University
Collin County Community College District	National University of Singapore
Coppin State University	Northern State University
Davidson College	Northwestern University
Eastern Mennonite University	Nova Scotia Community College
Eastern Michigan University	Oregon State University
Elon University	Pellissippi State Community College
Federation University Australia	Penn State Abington
Fordham University	Penn State Altoona
Forman Christian College University	Penn State Beaver
Furman University	Penn State Behrend
Gallaudet University	Penn State Berks
Georgia College & State University	Penn State Brandywine
Grand Canyon University	Penn State DuBois
Heidelberg University	Penn State Fayette
Humber College Institute of Technology & Advanced Learning	Penn State Greater Allegheny
	Penn State Harrisburg

Penn State Hazleton	The University of Memphis
Penn State Lehigh Valley	Thomas College
Penn State Mont Alto	Truman State University
Penn State New Kensington	University of Alaska Anchorage
Penn State Schuylkill	University of Arkansas
Penn State Shenango	University of Cape Town
Penn State University Park	University of Central Florida
Penn State Wilkes-Barre	University of Delaware
Penn State World Campus	University of Eastern Finland
Penn State Worthington Scranton	University of Florida
Penn State York	University of Maryland
Portland State University	University of Maryland, Baltimore County
Prince William Sound College	University of Michigan–Ann Arbor
Rose-Hulman Institute of Technology	University of Montana
Saint Michael’s College	University of Nevada, Las Vegas
Seattle Pacific University	University of Nevada, Reno
Sonoma State University	University of Notre Dame
South Dakota State University	University of Texas Rio Grande Valley
St. Norbert College	University of Washington
St. Petersburg College	Wayne State College
Tampere University of Technology	West Virginia University
Tarleton State University	Western Carolina University
The College of Saint Rose	Western Washington University
The Hong Kong Polytechnic University	William Paterson University of New Jersey
The Johns Hopkins University	Winona State University
The Ohio State University	

Notes

1. D. Christopher Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, research report (Louisville, CO: ECAR, October 2016): 14.
2. Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, 17–18.
3. FSR Team, “Dorms—Not Just for Sleeping Anymore,” *FSR*, February 10, 2017.
4. A plurality of students (20%) selected themselves, the Internet, and friends as their top 3 sources for technology help.
5. See [Ask 3 Then Me](#) for an excellent example from the K–12 context.
6. See “[ISTE Student 6: Guiding Students to Troubleshoot More Autonomously](#)” for some practical tips to help students take more control over their technology problems.
7. For more on this, see Michael J. Coren, “[New Research Shows ‘Digital Natives’ Are No Better at Technology Than the Rest of Us](#),” *Quartz.com*, July 30, 2017; and Paul A. Kirschner and Pedro De Bruyckere, “[The Myths of the Digital Native and the Multitasker](#),” *Teaching and Teacher Education* 67 (October 2017): 135–142.
8. For more on student and faculty attitudes, dispositions, and usage patterns of technology, respectively, see Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, 8–9, 45–46; and D. Christopher Brooks, with a foreword by John O’Brien, *ECAR Study of Faculty and Information Technology, 2015*, research report (Louisville, CO: ECAR, October 2015): 11, 54–56.
9. Claire Warwick, Jon Rimmer, Ann Blandford, Jeremy Gow, and George Buchanan, “[Cognitive Economy and Satisficing in Information Seeking: A Longitudinal Study of Undergraduate Information Behavior](#),” *Journal of the American Society for Information Science and Technology* 60, no. 12 (December 2009): 2402–2415; Chandra Prabha, Lynn Silipigni Connaway, Lawrence Olszewski, and Lillie R. Jenkins, “[What Is Enough? Satisficing Information Needs](#),” *Journal of Documentation* 63, no. 1 (2007): 74–89.
10. According to 2015 EDUCAUSE CDS data, 100% of institutions offer help desk services, and 92% offer self-service help options. See the CDS Almanac for [All U.S. Institutions](#) for more information on help desk services offered.
11. See the [Top 10 IT Issues graphic](#).
12. Susan Grajek and the 2016–2017 EDUCAUSE IT Issues Panel, “[Top 10 IT Issues, 2017: Foundations for Student Success](#),” *EDUCAUSE Review*, January 17, 2017.
13. See the [CDS Spotlight on Information Security](#).
14. *Ibid.*
15. Nick Statt, “[Best Practices for Passwords Updated after Original Author Regrets His Advice](#),” *The Verge*, August 7, 2017.
16. The [EDUCAUSE Cybersecurity Initiative](#) supports higher education institutions as they improve information security governance, compliance, data protection, and privacy programs. EDUCAUSE volunteers have created an [Annual Campus Security Awareness Campaign](#) that provides ready-made content that information security professionals and IT communicators can integrate into year-round campus communications to give students, faculty, and staff a steady stream of privacy and security awareness information.

17. In 2017, 99% of students claimed that their laptops are at least moderately important to their academic success; 78% said they are extremely important.
18. Nearly 6 in 10 students reported using their smartphones for half or more of their courses, but only a quarter of them said that they use their phones for all of their courses in 2017. By contrast, 94% of students use their laptops in half or more of their courses; 71% use them for every single course they take.
19. David Matthews, "Fear of Looking Stupid," *InsideHigherEd*, July 6, 2017.
20. Aubree Evans, "Active Learning in the Age of Classroom Cellphones," *InsideHigherEd*, July 11, 2017.
21. See Michael Prince, "Does Active Learning Work? A Review of the Research," *Journal of Engineering Education* 93, no. 3 (July 2004): 223–231; and Scott Freeman, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt, and Mary Pat Wenderoth, "Active Learning Increases Student Performance in Science, Engineering, and Mathematics," *PNAS* 111, no. 23 (June 10, 2014): 8410–8415. For more information, see the annotated bibliography "Evidence for the Efficacy of Student-Active Learning Pedagogies" by Jeffrey E. Froyd.
22. Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, 16–18. The items for this section are all significantly and positively correlated to students' overall technology experiences; that is, the more instructors students have who use technologies in the ways described here, the better the overall student technology experience.
23. Have adequate technical skills for course instruction: 2015 = 67%, 2016 = 69%. Use technology adequately for course instruction: 2017 = 65%. Use technology during class to make connections to the learning material or to enhance learning with additional materials (e.g., by providing audio or video examples/demonstrations/simulations of learning concepts): 2015 = 59%, 2016 = 61%, 2017 = 55%. Encourage you to use online collaboration tools to communicate/collaborate with the instructor or other students in or outside class: 2015 = 58%, 2016 = 57%, 2017 = 50%. Note that in 2017 we added an N/A or "Don't know" option, which could help explain the drop across the board. Prior to that, students who had trouble answering (e.g., they don't know what we mean by "online collaboration tools") might have defaulted to "None" or "Some."
24. 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).
25. Eden Dahlstrom and Jacqueline Bichsel, *ECAR Study of Undergraduate Students and Information Technology, 2014*, research report (Louisville, CO: ECAR, October 2014): 19–20; Eden Dahlstrom, with D. Christopher Brooks, Susan Grajek, and Jamie Reeves, *ECAR Study of Undergraduate Students and Information Technology, 2015*, research report (Louisville, CO: ECAR, December 2015): 17–21; Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, 24–34; and Brooks, *ECAR Study of Faculty and Information Technology, 2015*, 22–23.
26. Brooks, *ECAR Study of Faculty and Information Technology, 2015*, 16–17. Indeed, data from the 2017 faculty study say much the same. With 37% of faculty selecting it, "a clear indication or evidence that students would benefit" was once again the top factor that faculty tell us would motivate them to integrate more or better technology into their teaching practices and curriculum.
27. Brooks, *ECAR Study of Faculty and Information Technology, 2015*, 14–15, and Jeffrey Pomerantz and D. Christopher Brooks, *ECAR Study of Faculty and Information Technology, 2017*, research report (Louisville, CO: ECAR, October 2017).
28. D. Christopher Brooks, Lauren Marsh, and Kimerly Wilcox, "Engaging Faculty as Catalysts for Change: A Roadmap for Transforming Higher Education," *EDUCAUSE Review*, February 25, 2013.

29. Ibid.
30. There is, however, a robot, [FoldiMate](#), that can do this for you.
31. All differences reported here are statistically significant at the 0.0001 level ($p < 0.0001$).
32. See [Integrated Planning and Advising for Student Success \(iPASS\)](#).
33. D. Christopher Brooks, [IPAS Implementation Handbook](#), research report (Louisville, CO: ECAR, October 2014).
34. Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*.
35. A student who thinks she learns best in a course with no online components has a 48% probability of preferring a course with no online components compared to a 50% probability of preferring a course with some online components.
36. See Barbara Means, Yukie Toyama, Robert Murphy, Marianne Bakia, and Karla Jones, *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* (Washington, D.C.: U.S. Department of Education, Office of Planning, Evaluation, and Policy Development, 2010); and Barbara Means, Yukie Toyama, Robert Murphy, and Marianne Bakia, "The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature," *Teachers College Record* 115 (New York: Teachers College, Columbia University, 2013).
37. Doug Lederman, "[What Works in Blended Learning](#)," *InsideHigherEd*, July 26, 2017.
38. Brooks, *ECAR Study of Faculty and Information Technology, 2015*, and Pomerantz and Brooks, *ECAR Study of Faculty and Information Technology, 2017*.
39. Paul Baepler, J. D. Walker, and Michelle Driessen, "It's Not about Seat Time: Blending, Flipping, and Efficiency in Active Learning Classrooms," *Computers & Education* 78 (2014): 227–236.
40. John Whitmer, "[Patterns in Course Design: How Instructors ACTUALLY Use the LMS](#)," Blackboard Blog, October 27, 2016.
41. Malcolm Brown, "[The NGDLE: We Are the Architects](#)," *EDUCAUSE Review*, July 3, 2017.
42. "[7 Things You Should Know about NGDLE](#)," ELI, December 2015.
43. See the [July/August 2017](#) edition of *EDUCAUSE Review* for more on this topic.
44. Brown, "The NGDLE: We Are the Architects."
45. Terry Anderson and Jon Dron, "Three Generations of Distance Education Pedagogy," *International Review of Research in Open and Distributed Learning* 12, no. 3 (2011).
46. Jeffrey R. Young, "[When Professors Create Social Networks for Classes, Some Students See a 'Creepy Treehouse'](#)," *Chronicle of Higher Education*, August 18, 2008.
47. For some examples of technological applications (especially social media) for student learning, see [EdTech Sandbox](#).
48. Derek Bruff, *Teaching with Classroom Response Systems: Creating Active Learning Environments* (San Francisco: Jossey-Bass, 2009).
49. Dahlstrom et al., *ECAR Study of Undergraduate Students and Information Technology, 2015*, 20.

50. Richard W. Patterson and Robert M. Patterson, “Computers and Productivity: Evidence from Laptop Use in the College Classroom,” *Economics of Education Review* 57 (April 2017): 66–79.
51. Pam A. Mueller and Daniel M. Oppenheimer, “The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking,” *Psychological Science*, May 22, 2014.
52. Dahlstrom et al., *ECAR Study of Undergraduate Students and Information Technology, 2015*, 18.
53. Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, 30–34.
54. Evans, “Active Learning in the Age of Classroom Cellphones.”
55. Kep Lee Loh and Ryota Kanai, “Higher Media Multi-Tasking Activity Is Associated with Smaller Gray-Matter Density in the Anterior Cingulate Cortex,” *PLOS One* 9, no. 9 (September 2014); and J. M. Watson and D. L. Strayer, “Supertaskers: Profiles in Extraordinary Multitasking Ability,” *Psychonomic Bulletin & Review* 17, no. 4 (August 2010): 479–485.
56. “This Week’s Citation Classic,” Bernard Berelson and Gary Steiner, *Human Behavior: An Inventory of Scientific Findings* (New York, 1964). Nod to J. D. Walker of the University of Minnesota for bringing this gem to our attention.
57. For more information on campus technology help desk services, please explore the following EDUCAUSE resources: Deyu Hu, “Training to Improve University Computing Services,” *EDUCAUSE Review*, July 3, 2017; Peter Tinson, “Why You Should Champion Your Service Desk,” *EDUCAUSE Review*, August 11, 2014; and Leah Lang and Judith A. Pirani, *The 2014 Enterprise Application Market in Higher Education: IT Service Desk Management Systems*, research report (Louisville, CO: ECAR, August 19, 2015). Institutions participating in EDUCAUSE Core Data Service (CDS) can use their data to better understand how their help desk stacks up to that of their peers.