

ECAR Study of Undergraduate Students and Information Technology, 2019



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Executive Summary

Key Findings

- **While the majority of students (70%) prefer mostly or completely face-to-face learning environments, specific demographic factors influence these preferences.** Students who are married or in a domestic partnership, those who are independent with dependents, those who work 40 or more hours a week, students age 25 and older, and individuals who identified as having both a physical and a learning disability that require technology for their coursework all had a stronger preference for classes that are mostly or completely online.
- **Labs and demonstrations, faculty/student conferences, and lectures were rated as the most preferred activities in completely face-to-face environments.** Students see in-class lectures as opportunities to engage with instructors, peers, and course content, and they see technology as a means to that engagement. The majority of students prefer some form of blended environment for collaborations or projects with peers, homework/assignment submission, peer reviewing/peer grading, exams, quizzes or tests, and asking questions.
- **For the students who use them, online success tools have become increasingly useful in navigating their college experience.** Tools related to degree planning and degree auditing were valued the most, and “self-service referral systems for social or community resources” (e.g., community events and crisis counseling) and “tools that suggest how to improve performance in a course” saw the greatest gains in perceived usefulness since last year.
- **Dormitories/campus housing and outdoor spaces continue to be rated at the bottom when it comes to reliable Wi-Fi.** Outdoor spaces received the lowest marks, with more than a third of students reporting their experiences as poor or fair, while libraries and classrooms still top the list for the best Wi-Fi on campus.
- **Two-thirds of students agreed that their instructors use technology to engage them in class, but it is not always with the devices students already own.** Significantly fewer students said they are encouraged to use their personal technology as tools to deepen their learning. Half of the respondents said their instructors ask them to use their laptops in class, and only a quarter reported they were encouraged to use their smartphones.
- **Only half of the students who have physical and/or learning disabilities and who need accessible technologies or accommodations rated their institution’s support positively.** Nearly a quarter said their institution’s

support (21%) and awareness (24%) was poor or fair. Of particular concern is the 11% of students with disabilities who said their institution was not aware at all of their technology needs, which suggests many may experience barriers to disclosing their disability, including stigma and their own lack of awareness of available support services.

Recommendations

- **Leverage analytics to gain a greater understanding of the student demographics that influence learning environment preferences.**
Information such as student marital status and the number and ages of dependents gives institutions additional data points that can shed light on the learning environments students choose, as well as the resources that can be offered to help them succeed in those settings. Integrate more intentional use of technology to increase the interactivity of learning tasks and activities students prefer experiencing in face-to-face environments, such as lectures and labs, to maximize face time with instructors and peers.
- **Continue to promote online success tools and provide training to students on their use through orientations and advisement sessions.**
Implement advising tools first with student-facing staff and faculty to communicate the value of such tools and their most effective use. Partner with other campus stakeholders such as counseling services and health centers to market self-service referral systems for social or community resources to reach more at-risk learners and students in crisis. Keeping its risks in mind, explore the possibilities of predictive analytics with the use of success tools as a supplement to the personalized support of student advisors.
- **Expand efforts to improve Wi-Fi reliability in campus housing and outdoor spaces.** Upgrade wireless networks in residence halls, and explore the benefits of dual network configurations to reduce the number of student-provided access points that contribute to connectivity confusion. Increase the number of outdoor access points, and invest in durable, weatherproof equipment with directional antennas to boost coverage.
- **Allow students to use the devices that are most important to their academic success in the classroom.** Provide training to faculty on the purposeful integration of student-owned technology for more inclusive, active, and engaged learning. Offer alternatives to in-class tech bans, such as involving students in the development of their class's technology policy and designated seating for device users.

- **Establish a campus community to address accessibility issues and give “accessibility evangelists” a seat at the table.** Colleagues and students with disabilities can be valuable consultants who offer perspectives on the barriers they experience with tech inaccessibility in their learning environments. Partner with units across campus such as disability services, advisement, health services, and admissions to educate all students on the available accessible technology services and how to request them. Tap the expertise of teaching and learning centers and instructional designers to train faculty on the universal design for learning (UDL) framework to promote inclusive strategies that benefit all learners.

Introduction

For 16 years, the EDUCAUSE Center for Analysis and Research (ECAR) has conducted research on information technology (IT) and higher education's most important end users, undergraduate students. While the form and findings of these reports have evolved over the years, the thread that binds them is a desire to understand how students are thinking about and using technology in service to their academics. IT units in higher education are the primary audience for this report, but the findings and recommendations can be used by multiple organizations and individuals across campuses at every type of institution. Faculty developers, instructors across the disciplines, advisors, professionals in admissions and student affairs, disability service staff and advocates, student health staff, and scholars and researchers can all find information here that is relevant to their work with and about undergraduate students and technology.

The content and organization of this year's report were selected to address issues related to student success and the student-centered institution, which were rated by IT professionals as No. 2 and No. 4, respectively, in the [Top 10 IT Issues for 2019](#). As colleges and universities work toward improving student outcomes, the report offers insights and suggestions that assist in understanding and meeting the individualized needs of students, which can empower them on their academic journey. Of particular note is our discussion of the changing landscape of student demographics and how life circumstances can play a role in students' learning environment preferences. As a continuation of our diversity, equity, and inclusion (DEI) initiative, we also include for the second year the perspectives of students with disabilities on how their institutions are attending to the accessible technology they require for their academics.

We have chosen to present and discuss aspects of the 2019 study of undergraduate students and IT that correspond to those in this year's forthcoming companion study of faculty and IT, which offers readers an opportunity to explore each of the included topics through the perspectives of both learning and teaching. In both this report and the faculty study, readers will find data and analysis related to the following topics:

- Learning environment preferences
- Student success tools
- Technology experiences
- Technology use in the classroom
- Accessibility

For the 2019 report, 53,475 students from 160 institutions in 7 countries and 38 US states participated in the research. The quantitative findings in this report were developed using the 40,596 survey responses from 118 US 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, student populations, and culture of an institution will inevitably affect the meaning and use of these findings in a local context. Moreover, considering the findings reported here about undergraduate students in relation to 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 technology use on campus but as the beginning.

Learning Environment Preferences

Do students prefer face-to-face, blended, or online? Well, it depends....

Student populations on US college and university campuses are becoming more diverse, and this trend is expected to continue well into the 2020s.¹ As Ted Mitchell of the American Council on Education (ACE) has pointed out, the new “normal” student is not fresh out of high school but is instead “just as likely to be a twenty-five-year-old returning veteran, a thirty-year-old single parent, or a fifty-three-year-old displaced worker who is looking to reskill and retrain.”² And our findings this year suggest that these student demographics and enrollment trends are factors that can influence the kinds of learning environments students prefer and select when taking their courses.

About half of respondents (56%) said they prefer some form of blended learning³ for their classroom environments—neither fully face-to-face nor fully online—and this preference was consistent across institutional type and size, as well as student ethnicity and gender. Looking more closely, however, we find that student preferences strongly lean (70%) toward in-person environments. Two in five students (38%) told us they prefer courses that are *solely* face-to-face, and another third (32%) favor settings that are *mostly* face-to-face. This finding suggests that students value the interactions with instructors and peers that can come with courses held in brick-and-mortar classrooms. In contrast, only a small percentage of students (9%) reported preferring environments that are mostly or completely online, and these inclinations could be driven by their work and family obligations.

Preferences Can Depend on Life Outside the Classroom

Which students are inclined toward online environments? When we explored key demographic factors, we found that respondents who were married or in a domestic partnership, those who were independent and had dependents of their own, and students who worked 40 or more hours a week were more likely than their peers to prefer environments that are mostly or completely online. Students age 25 and older and individuals who identified as having both a physical and a learning disability that require technology for their coursework also had a stronger preference for classes that are primarily or fully online (figure 1).

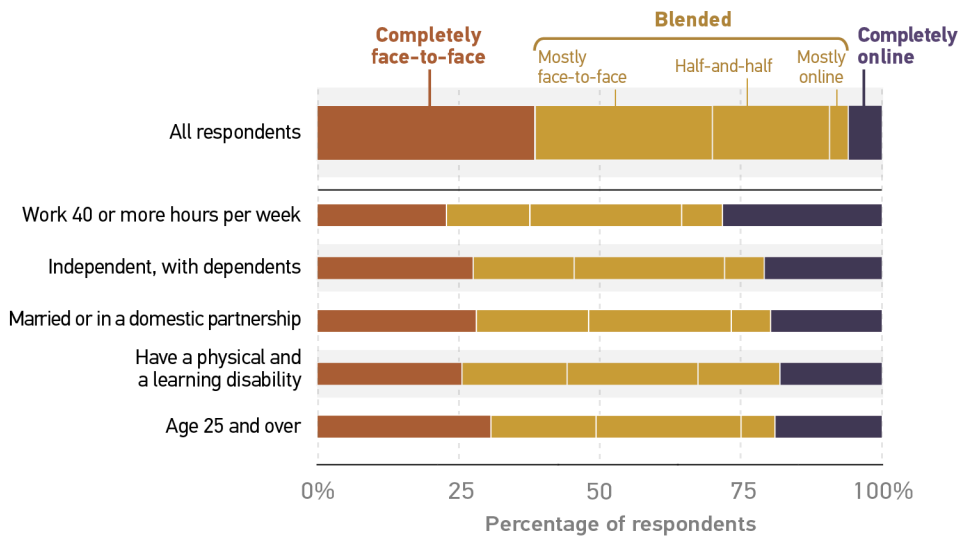


Figure 1. Student learning environment preferences, by key student demographic factors

To learn more about their experiences in online environments, we asked students if they had taken any courses that were entirely online in the past year. Half (51%) of our respondents said some of their courses were taken fully online, while only 6% said all of their courses were completely online. Among all students, more women, Hispanic/Latinx, and black students reported taking *some* of their courses completely online than taking either all or none of their classes online. We also found that more married students, students who are independent with dependents (e.g., children or other family members), those with a physical disability, and those with both a physical and a learning disability took *all* of their courses fully online. These findings shed additional light on why these particular environments might be the first choice for students who have individualized needs. Online courses are likely a more practical choice for students who are working long hours and aren't able to get to campus for class. These environments can also afford students more flexibility when attending to parenting and caregiving responsibilities. Fully online classes can also be logistically easier for students with disabilities, especially for those with mobility issues who have challenges with transportation and/or the physical navigation of a brick-and-mortar campus, as well as individuals with chronic conditions that impede in-person attendance.

Preferences Also Depend on the Activity or Assignment

What about the activities that actually take place in those courses? Do students have a learning environment preference for how they submit assignments, take a test, or collaborate with peers? To better understand student attitudes about *how* they engage with a particular task, we asked them to tell us their preferred environments—from strictly face-to-face, to completely online, or somewhere in between—for the kinds of activities they would do in a typical class. Our results suggest that their predilections can differ on the basis of the learning task itself, and we found considerable agreement on their preferences for face-to-face settings for particular activities. Labs/demonstrations was the most preferred activity for a completely face-to-face environment, with 67% of respondents rating it at the top, followed by faculty/student conferences (61%), and lectures (52%) (figure 2). Labs or demonstrations and conferencing in face-to-face settings can provide opportunities for real-time conversation, immediate feedback, and clarification. These activities were also rated among the least preferred for completely online environments, which suggests that many students value having these particular experiences in person and that they are looking for opportunities to have engaging interactions with their instructors and peers during class. Examples from many qualitative responses⁴ from students this year demonstrate that they see an in-class lecture as a site where meaningful connections can be made with their instructors, classmates, and the material and that technology is a conduit for those connections. But they want to be more than in-class spectators:

- “I want my professors to stop reading PowerPoint slides word-for-word off of a screen, and to start using the technology at hand to create a different kind of lecture that will engage their students in the learning process.”
- “I’d love for there to be more interactive polling and questions during class. Even though I don’t like the idea of being in lecture every day, that would keep me more engaged if the instructors were more dynamic with their tech use.”
- “Integrate [technology] more into lectures. It’s very difficult to sit and watch you talk. Technology can be so beneficial to learning if used in the right ways to enhance and complement lectures. Use collaborative quizzes (Kahoot, etc.), let us research in class, etc.”
- “Provide more online learning tools such as interactive lectures where people on laptops or tablets can also engage with the material being presented.”

“I think the number-one thing I would like to see my instructors using technology for would be engagement with the class. Currently, my instructors tend to use technology almost entirely as a presenting interface, which I feel is a missed opportunity given the vast possibilities technology poses for engagement.”

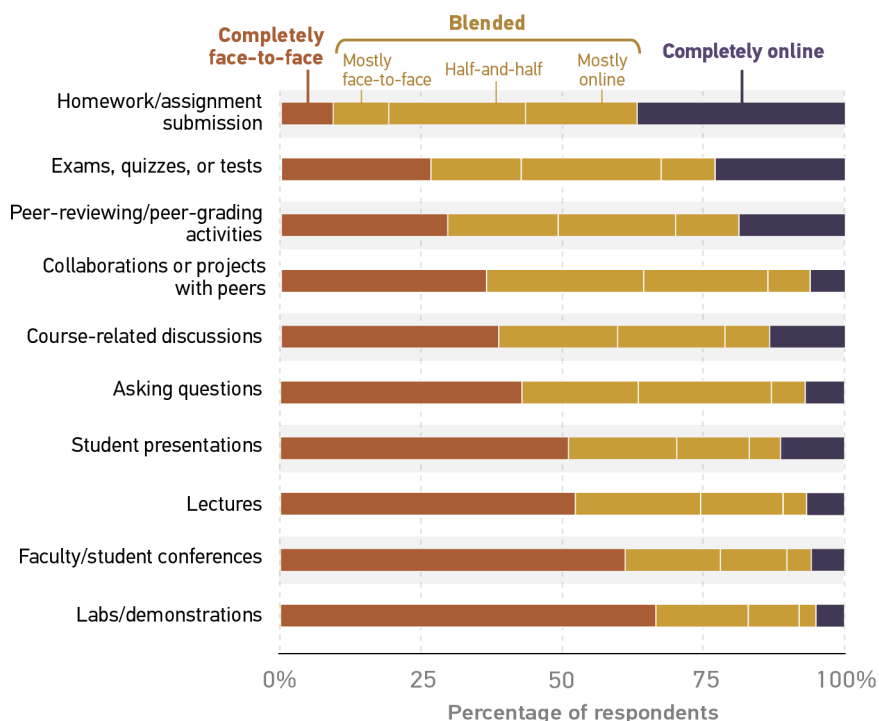


Figure 2. Student learning environment preferences for specific course-related activities and assignments

At the other end of the learning environment spectrum—online-only settings—homework/assignment submission (37%), exams, quizzes, or tests (23%), and peer-reviewing/peer-grading (19%) were the three most preferred activities. However, it is worth noting that, overall, far fewer students said they preferred completely online to completely face-to-face settings for the activities we asked about. Our results indicate the majority of students like some form of blended environment for collaborations or projects with peers (57%), homework/assignment submission (54%), peer-reviewing/peer-grading (52%), exams, quizzes, or tests (51%), and asking questions (50%).

To turn these findings into action, instructors can take a more student-centered approach when choosing an environment for a particular learning task. Incorporating active learning strategies that integrate technology (such as online collaborative quizzes and polling) into traditional lectures and labs offers opportunities to engage students and maximizes face time with instructors and peers. With online and blended learning rated No. 2 in the 2019 Key Issues in Teaching and Learning, it’s clear that higher education community members see the importance of working in this area. With this in mind, faculty can collaborate with instructional designers to identify opportunities

to leverage online and blended environments. For example, greater utilization of the institution's learning management system (LMS) for the submission and evaluation of assignments could benefit students with mobility disabilities, who could conduct these activities without needing to get to and from campus. As one student noted in our survey, "turning in homework online would be ideal considering walking is exhausting [and] my physical disabilities keep me home a lot." But when we consider accessible and universal design for learning (voted No. 5 in ELI's key issues for 2019), such a practice becomes a "curb-cut"⁵ for the classroom. That is, just as sidewalk curb cuts—designed to aid individuals using wheelchairs—also benefit those with strollers and rolling luggage, submitting assignments online can be helpful and have a positive impact on all learners: the student at home with the flu, the mother who has childcare issues, or the part-time student who must work an extra shift.

Student Success Tools

Online tools help students navigate their college experience.

Our data suggest that online student success tools at colleges and universities are valuable to many of the students who use them. Like a college-specific GPS, these tools can help students map degree paths, navigate enrollment and business systems, identify roadblocks that can cause academic breakdowns, and find service points and resources along the way.

Students who used their institution's online success tools⁶ ranked “degree audit tools that show the degree requirements completed” as the most useful (80% rated them very or extremely useful). “Degree planning or mapping tools that identify courses needed to complete a degree” came in second (77%), followed by “self-service tools for conducting student-related business” (74%). We also observed incremental increases in the positive ratings of all the online tools included in the survey since 2017⁷ (figure 3), with students finding them each a little more useful than the year before. Although a few tools saw only a slight bump in positive assessments over the past two years, others experienced gains of 10 percentage points or more. This gradual growth, albeit marginal for some tools, suggests that many students see online success tools as increasingly valuable in traversing their college experience.

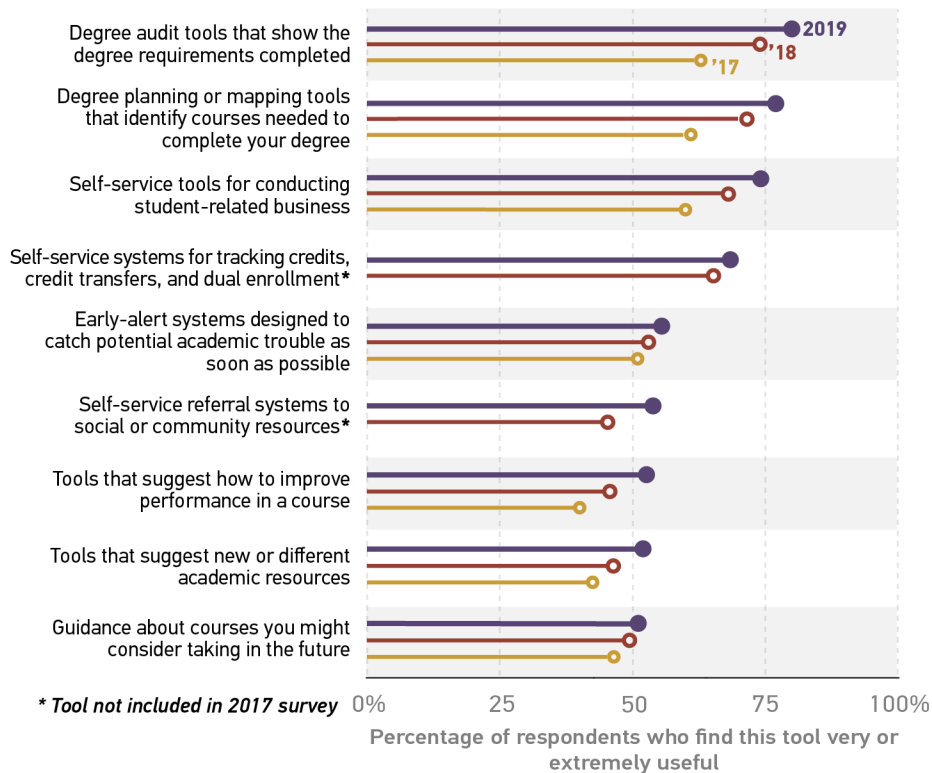


Figure 3. Increase in the perceived usefulness of online student success tools, 2017–19

The tools that saw the largest gains in usefulness between 2018 and 2019 include “self-service referral systems for social or community resources,” such as community events and crisis counseling (up from 45% to 54%), and tools that “suggest how to improve performance in a course” (an increase from 45% to 53%). Similar to last year, our results also suggest that students in some groups found tools that aid in academic success more helpful than their peers did. For example, nonwhite students reported significantly higher ratings of usefulness for tools that suggest how to improve performance in a course than their white peers. The significant increase in usefulness ratings for self-service referral systems for social and community resources is particularly heartening news for at-risk students and those in crisis, especially in light of the rising rates of student mental health conditions such as depression and anxiety.⁸ If students find these tools helpful, then they may be more likely to tap counseling and other community resources when they are most needed, and these services can be vital in supporting student mental and physical wellbeing.

IT units can use these data as motivation to continue efforts to communicate the usefulness of online tools to students, faculty, and advisors. Research has shown that for some institutions that have undertaken iPASS (Integrated Planning and Advising for Student Success) initiatives, advising tools are having an impact in the form of increased retention⁹ and a rise in staff collaboration and advising appointments for students.¹⁰ But effective implementation of these systems is key to favorable outcomes and long-term results. Education and training, buy-in, and institutional capacity for successful implementation are all needed, so institutions should be prepared to address these areas. A top-down approach is not likely to be enough to put these tools into action. Gaining insight into what is needed, used, and unnecessary from key stakeholders—students, faculty, and advisors—is an initial step in assessing how best to leverage these resources for student success.¹¹

IT organizations might also consider exploring the use of success tools with predictive analytics, which have helped some institutions improve grades and graduation rates for at-risk students, as well as increase minority enrollment and completion of STEM programs.¹² However, colleges and universities should also be aware of the risks that can come with the use of predictive analytics, from issues related to false positives and data errors, to student privacy and bias.¹³ When implemented thoughtfully, responsibly, and as a supplement to—not a replacement for—the guidance and support of trained student advisors, online success resources can be part of the larger college toolkit to help students stay on the road that leads to academic achievement and graduation.

Technology Experiences

Students are generally happy, but Wi-Fi access could (of course!) be better.

Technology is woven into practically every aspect of the student experience. Whether students are enrolling in a course, submitting a paper, downloading an article from the library, FaceTiming with family, or streaming *The Office* between classes, they rely heavily on the digital resources provided by their institutions for their work, personal business, and leisure. Students are the largest group of end users IT units serve; as a result, their satisfaction with the technologies their institutions supply and support matters. And from what students tell us, their schools are doing a solid job of providing positive, comprehensive technology experiences. As in the past two years, more than three-quarters (79%) of respondents reported their overall technology experiences as good or excellent, and this was consistent across institution size and type, as well as key demographic factors such as gender, ethnicity, and age. Only 2% of students reported their experiences with technology as poor.

Other trends that also seem to be holding are those related to student experiences with access to campus Wi-Fi. While the majority of respondents (65%) rated their Wi-Fi login experience as favorable, our data suggest that some campus access points (APs) are still better than others. Our previous research has shown that student experience with technology as a whole is associated with the quality of their interactions with their campus networks.¹⁴ Libraries continue to be the most reliable spot on campus to connect to Wi-Fi, with the majority of respondents (81%) rating access as good or excellent, and classrooms/instructional spaces are a close second (74%). Sixty percent of respondents rated wireless access in student housing and dorms as positive, which is a slight increase from 2018 (52%). But with nearly a quarter (24%) of students reporting access as poor or fair in on-campus residences, room for improvement remains. And our results suggest that there's even more work to be done when it comes to Wi-Fi in outdoor spaces. These spaces on campus received the lowest marks for reliable access, with 38% of students reporting their experiences as poor or fair.

Although gains have been seen in positive experiences with Wi-Fi in campus housing and outdoor spaces since 2017, the needle is moving slowly (figure 4), and higher education IT should continue its efforts to improve the reliability of access in these areas. To decrease wireless network pain points in residence halls, IT units can look for solutions that cut down on connectivity confusion. For example, Elon University switched entirely to wireless in residence halls and then configured dual networks to funnel traffic on the basis of device type—one for academic workhorse tech such as laptops and another “gadget network” for gaming and other smart devices.¹⁵ Upgrading wireless access

“Please make Wi-Fi more consistent in the dorms!! It is frustrating to have to walk to the library just to do one assignment.”

“Provide Wi-Fi in more outdoor spaces so I can study and do homework almost everywhere.”

in dormitory rooms can greatly reduce (or eliminate entirely) the number of students who supply their own access points, which may interfere with each other and impact access.¹⁶ To increase outdoor connectivity, Kennesaw State University and other institutions have doubled the number of APs, using those with directional antennas to boost coverage. Selecting APs that are durable and waterproofing them for wet climates can also bolster their functionality, adding to their longevity.¹⁷ Improving Wi-Fi reliability in outdoor campus spaces can be particularly helpful for students on tight budgets, as it allows them to offset the costs of their own data plans by using secure public networks.

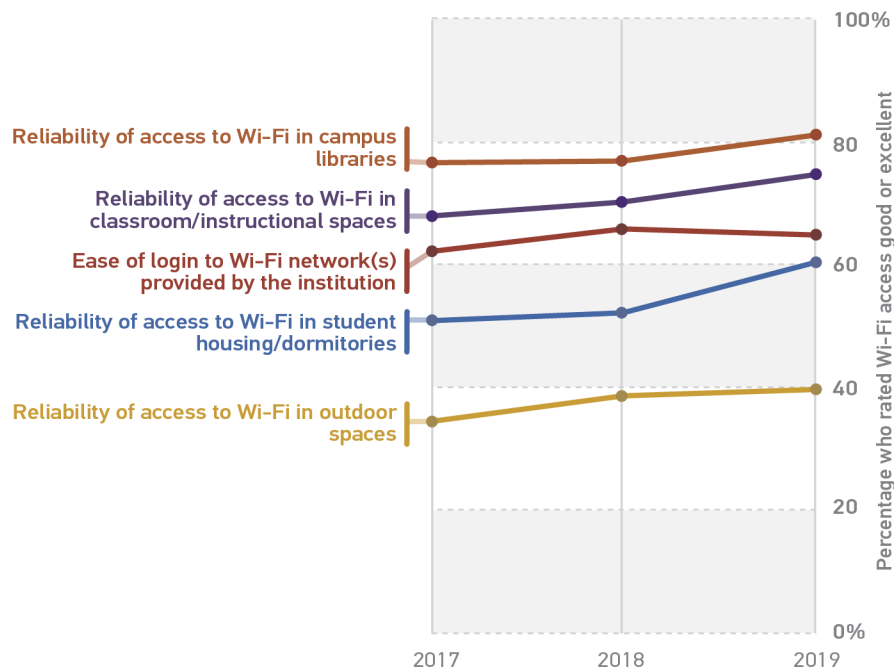


Figure 4. Positive student experiences with campus Wi-Fi, 2017–19

Technology Use in the Classroom

Faculty use technology, but not always the kind students own.

Many students this year told us they would like to be more engaged with the material, their instructors, and their peers in the classroom and that they see technology as a vehicle for that engagement. With the vast array of digital educational tools available today, opportunities to incorporate technology into the classroom in meaningful ways continue to rise. To be sure, instructors have access to and are using various kinds of technologies for teaching, and, according to students, some tech approaches and applications are more prevalent than others. However, there continues to be a split between instructor-focused use of technology, such as providing audio and video content for learning, and student-centered practices, whereby students are asked to use the devices they already have as learning tools. The majority of students agreed that their instructors typically use tech to engage them in the learning process (66%), use technology to enhance learning with additional materials (67%), and encourage the use of online tools to communicate/collaborate with the instructor or students in or outside class (62%); these responses were consistent across institution type and size. However, significantly fewer students (40%) reported that their instructors encourage them to use their own devices during class to deepen learning (e.g., by searching online for related concepts, examples, or demonstrations). Half of respondents said their instructors have them use their laptops for in-class learning, and only a quarter reported that instructors ask them to use their smartphones (figure 5).

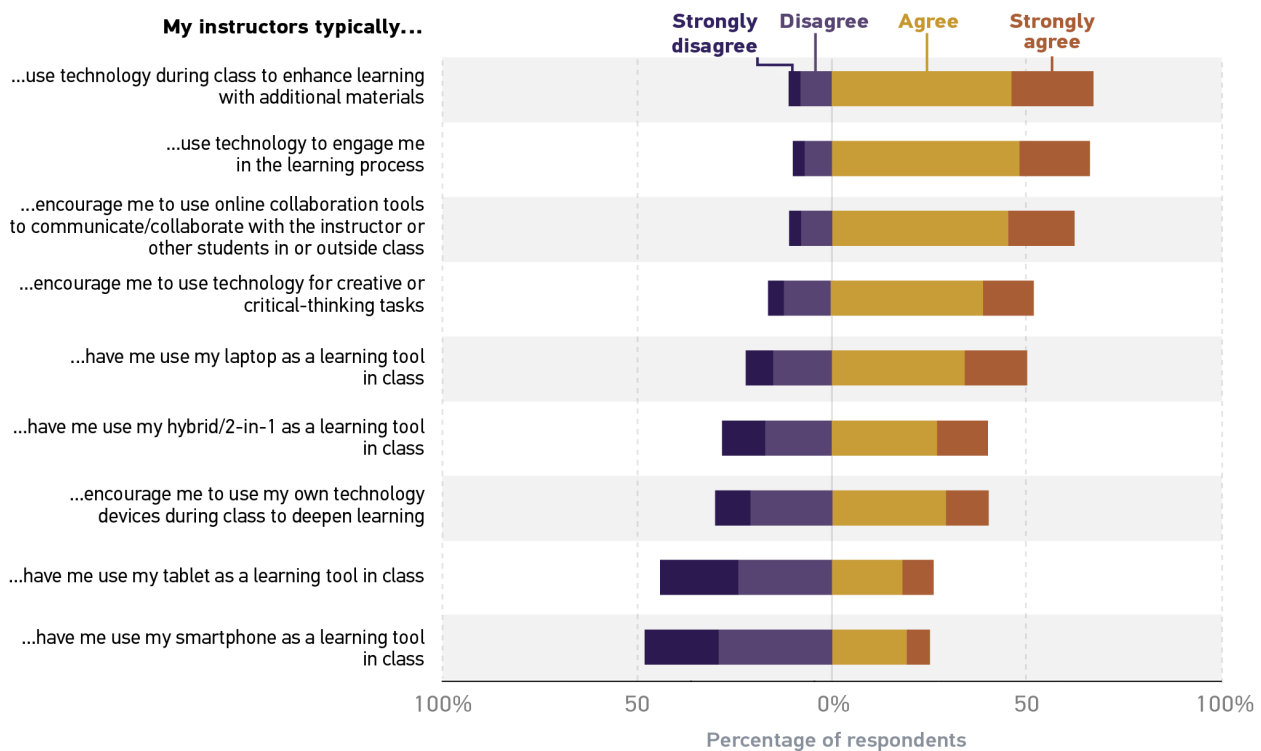


Figure 5. Student experiences with instructors and technology

The lack of movement on these numbers in the past year suggests that the attitudes some faculty have about mobile tech in the classroom are slow to change, and our findings from the 2019 faculty study support this. According to the forthcoming 2019 ECAR study of faculty and information technology, about half of faculty reported banning smartphones, and fewer than half said they encouraged or required the use of laptops. Faculty may frown on the use of these devices or ban them outright if they consider them to be distractions instead of learning tools. But students are using their own devices for educational purposes now more than ever,¹⁸ especially as IT units implement and make upgrades to institutional apps (i.e., the LMS and student portals)¹⁹ and as more reduced-cost/rental e-textbooks and open educational resources (OER) programs are offered to students.²⁰ For example, some students noted in their open responses that they want to be able to use their devices in class so they can access their textbooks:

- “Many of my professors do not allow technology in the classroom. Most of the books I need for class are much cheaper as digital copies, and if I need to bring the book to class, I should be allowed to utilize the technology I have access to.”
- “I’ve had a few instructors who were strict on the no-technology-during-class policy. The majority of my textbooks/readings are on my tablet for easy access, so it was sometimes difficult to participate in class discussions about the readings.”
- “Many instructors oppose using laptops in class. This is very troublesome for me because most of my textbooks are digital. They effectively prohibit me from using my textbook in class.”

Now that the “digital first” textbook movement is under way,²¹ restrictions on mobile devices can be especially problematic for students who use e-books (because they are often less expensive than hard copies) and may impact their engagement and learning in class. Our data from 2018 suggested that policies that discourage or ban the use of technology in class may disproportionately impact underrepresented groups (such as students with disabilities, students of color, and first-generation students), as these students attributed significantly greater levels of importance to their mobile devices for their academics.²² And classroom policies that limit usage of personal devices to only those who have a disability accommodation effectively force those students to disclose their disability via their device use, and they may feel pressure to defend their need to peers. As one student noted, “If students with learning disabilities are the only ones allowed to have a computer, then it makes it clear to the rest of the class that they are different. Teachers need to allow technology for all students, regardless of their personal beliefs about how students should be learning.”

Recent research has also shown that device bans can negatively impact student engagement with course content. Students in introductory psychology courses where technology is banned reported significantly lower levels of engagement than did their peers in the same courses where technology was permitted. The researchers found no statistically significant differences in end-of-term grades between the two environments.²³

With “incorporation of mobile devices in teaching and learning” and “open educational resources” coming in at No. 4 and No. 5, respectively, in The Top 10 Strategic Technologies for 2019, it is apparent that the higher education IT community recognizes how these technologies can enrich the student experience. IT units can partner with teaching and learning centers to offer faculty workshops and training on how to integrate these technologies into their courses in ways that purposefully fulfill their educational objectives. As Derek Bruff writes in his book *Intentional Tech: Principles to Guide the Use of Educational Technology in College Teaching*, technology is an effective method of formative assessment, which allows instructors to gauge student learning in real time. The intentional use of tech, such as using classroom response systems (i.e., clickers, Twitter), can make learning visible and give instructors an opportunity to practice “agile teaching,” whereby they can capture student thinking and respond to the needs of learners in the moment.²⁴ Faculty developers and instructional designers should also share with instructors the implications and potential impacts of technology bans, offering alternatives to rigid in-class tech policies that have demonstrated impact.²⁵ Sharing different approaches can also create space to show instructors the active learning opportunities that open up when the devices students already own and regularly use for their academics are leveraged in class. Starting small by trying out a new app or activity using student mobile devices allows faculty to experiment, diversify their instructional approaches for a broader range of learners,²⁶ and even learn from the students themselves about the digital resources and apps that students find most useful.²⁷

Accessibility

Tech support for students with disabilities needs improvement.

To help organizations understand the difference between diversity and inclusion, leadership and management expert Jaye Goosby Smith uses the metaphor of a garden. She explains that diversity can be thought of as the varying types of plants in a garden, or people in an organization, and inclusion as the soil, which relates to the “conditions that make people willing and able to bring their best to the organization to achieve its goals.”²⁸ With accessibility and universal design ranking in the top 10 in the ELI Key Issues in Teaching and Learning the past four years in a row,²⁹ higher education professionals continue to recognize the importance of an inclusive college education and the challenges and opportunities that come with cultivating accessible learning environments. Our findings related to accessibility provide insights into the tech experiences of students with disabilities, as well as suggestions for how those experiences can be enriched to encourage their academic success.

Six percent of our respondents identified as having physical disabilities, learning disabilities, or both physical and learning disabilities that require accessible technologies or accommodations for their coursework, and these students were less satisfied with their overall technology experiences at their institutions than their peers.³⁰ Among those who identified as having a disability, only half (53%) rated the support their institutions provided for their technology needs positively; these results were consistent across Carnegie class and enrollment size. Similarly, half of students with disabilities told us their institution’s awareness of their needs for accessible technologies was good or excellent. However, our findings suggest that the academic needs of a significant portion of this population are not being met. Among those with disabilities, about a quarter rated their institutional support (21%) and awareness (24%) as poor or fair. Especially concerning is the 11% of students with any disability who reported that their college or university was not aware at all of their need for accessible technology, and this number was slightly higher for students with physical disabilities (figure 6).

11% of students with disabilities said their institution was not aware of their need for the technologies required for their coursework.

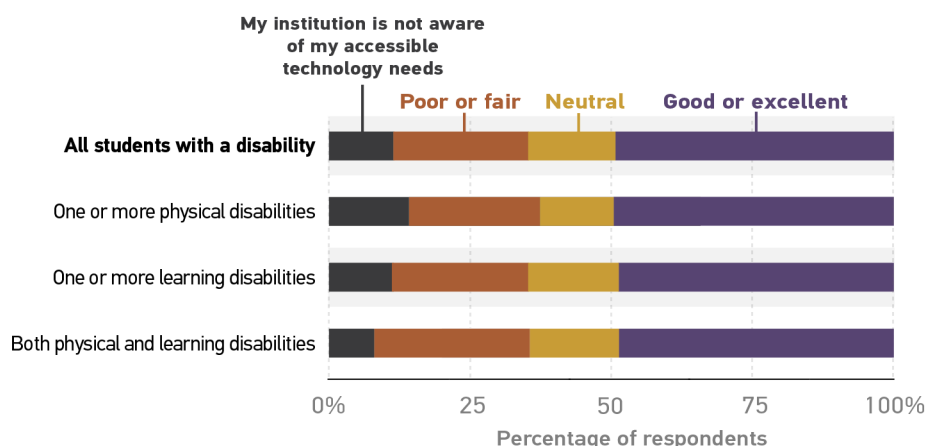


Figure 6. Student perspectives of institutional awareness of accessible technology needs, by disability

Students with disabilities may not even be on their institution’s radar and consequently could slip through the cracks. As we reported in the 2018 student study, many students choose not to disclose their disabilities to their institution³¹ and as a result do not receive the necessary accommodations available to them. There are various reasons for failing to register with their campus’ Office of Disability Services (ODS) and/or not using their accommodations to the fullest extent. Students may want to feel more self-sufficient and avoid the stigma of “disability” they experienced in K–12 settings so as not to feel singled out. Disability research also suggests that negative experiences with faculty who question their need for certain accommodations or penalize them are additional reasons some choose not to disclose, along with the desire to avoid similar experiences with peers. Some students are also unaware of the available services and don’t know how to navigate the postsecondary system (which requires strong self-advocacy) in order to use them. In addition, some individuals may perceive the services they do receive as lacking in quality or utility.³² These barriers, like rocky or impacted garden soil, can prevent students with disabilities from taking root in their college community and can hinder their success.

Lack of disclosure can often catch both institutions and students in an unproductive loop: many students don’t share their need for accommodations, and institutions can’t meet these needs if they don’t know about them. Cultivating an inclusive environment where students feel comfortable disclosing their disability requires cultural and behavioral change, which is no small feat. But creating a campus tech accessibility community and recruiting “accessibility evangelists”—colleagues who have firsthand experience with disability³³—can

be a good way to start sowing the seeds of change. Inviting members from across campus, including students themselves, to participate in such a community offers listening opportunities to better understand accessibility and the barriers and challenges individuals with disabilities face and to develop plans and guidelines for providing and adapting technology to encourage disclosure and better meet their needs.

Through orientation and advisement sessions from the time students enroll, a college or university can educate them about self-advocacy, the technology services available to them, and how to navigate the campus disability system to make their school aware of their needs. Training faculty on universal design for learning and best practices for meeting the needs of all students—regardless of their learning differences—is also key to providing conditions that promote cultural change.³⁴ Designing services and resources from the ground up with all learners in mind would ideally remove the need for disclosure and accommodation and reduce learning barriers across the board. IT units should work proactively with disability services and advocates, as well as assistive technology centers and faculty developers, to weed out the perception that accommodations provide an unfair advantage, when they are in fact designed to help level the playing field so that students with disabilities have equal opportunities to succeed and grow alongside their peers.

Recommendations

- **Leverage analytics to gain a greater understanding of the student demographics that influence learning environment preferences.** Information such as student marital status and the number and ages of dependents gives institutions additional data points that can shed light on the learning environments students choose, as well as the resources that can be offered to help them succeed in those settings. Integrate more intentional use of technology to increase the interactivity of learning tasks and activities students prefer experiencing in face-to-face environments, such as lectures and labs, to maximize face time with instructors and peers.
- **Continue to promote online success tools and provide training to students on their use through orientations and advisement sessions.** Implement advising tools first with student-facing staff and faculty to communicate the value of such tools and their most effective use. Partner with other campus stakeholders such as counseling services and health centers to market self-service referral systems for social or community resources to reach more at-risk learners and students in crisis. Keeping its risks in mind, explore the possibilities of predictive analytics with the use of success tools as a supplement to the personalized support of student advisors.
- **Expand efforts to improve Wi-Fi reliability in campus housing and outdoor spaces.** Upgrade wireless networks in residence halls, and explore the benefits of dual network configurations to reduce the number of student-provided access points that contribute to connectivity confusion. Increase the number of outdoor access points, and invest in durable, weatherproof equipment with directional antennas to boost coverage.
- **Allow students to use the devices that are most important to their academic success in the classroom.** Provide training to faculty on the purposeful integration of student-owned technology for more inclusive, active, and engaged learning. Offer alternatives to in-class tech bans, such as involving students in the development of their class's technology policy and designated seating for device users.
- **Establish a campus community to address accessibility issues and give “accessibility evangelists” a seat at the table.** Colleagues and students with disabilities can be valuable consultants who offer perspectives on the barriers they experience with tech inaccessibility in their learning environments. Partner with units across campus such as disability services, advisement, health services, and admissions to educate all students on the available accessible technology services and how to request them. Tap the expertise of teaching and learning centers and instructional designers to train faculty on the universal design for learning (UDL) framework to promote inclusive strategies that benefit all learners.

Methodology

In 2019, 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 2019 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 15, 2019, and April 6, 2019, and 53,475 students from 160 institutional sites responded to the survey (see tables M1 and M2). 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, by institution type*

Institution Type	Institution Count	Invitations	Response Count	Group Response Rate	Percentage of Total Responses	US Percentage
AA	18	107,565	4,281	4%	8%	11%
BA public	20	30,981	1,074	3%	2%	3%
BA private	5	10,549	1,149	11%	2%	3%
MA public	24	132,548	9,260	7%	17%	23%
MA private	12	30,129	3,171	11%	6%	8%
DR public	31	357,419	19,720	6%	37%	49%
DR private	4	20,498	1,473	7%	3%	4%
Specialized/ other US	4	8,352	468	6%	1%	1%
Total US	118	698,041	40,596	6%	76%	100%
Outside US	41	254,244	12,878	5%	24%	n/a
Grand total	160	952,285	53,475	6%	100%	n/a

* US institutions not in the Carnegie universe were classified as "Other US."

The quantitative findings in this report were developed using 40,596 survey responses from 118 US 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 are also included, where applicable, to characterize longitudinal trends.

Table M2. Demographic breakdown of survey respondents

	US Institutions	Non-US Institutions	All Institutions
Basic demographics			
Ages 18–24	83%	75%	81%
Ages 25+	17%	25%	19%
Male	36%	45%	38%
Female	64%	55%	62%
White	59%	n/a	n/a
Black/African American	6%	n/a	n/a
Hispanic/Latinx	15%	n/a	n/a
Asian/Pacific Islander	10%	n/a	n/a
Other or multiple races/ethnicities	11%	n/a	n/a
Student profile			
Freshman or first year	26%	33%	28%
Sophomore or second year	22%	25%	23%
Junior or third year	25%	18%	23%
Senior or fourth year	20%	14%	18%
Other class standing	7%	10%	8%
Part time	14%	9%	13%
Full time	86%	91%	87%
On campus	37%	18%	32%
Off campus	63%	82%	68%
First-generation college student	25%	31%	27%
Eligible for Pell Grants	34%	n/a	n/a
Major			
Agriculture and natural resources	2%	2%	2%
Biological/life sciences	9%	4%	8%
Business, management, marketing	13%	20%	15%

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	US Institutions	Non-US Institutions	All Institutions
Communications/journalism	4%	2%	3%
Computer and information sciences	8%	10%	8%
Education, including physical education	6%	4%	5%
Engineering and architecture	11%	16%	12%
Fine and performing arts	3%	1%	3%
Health sciences, including professional programs	14%	9%	13%
Humanities	3%	5%	3%
Liberal arts/general studies	3%	1%	3%
Manufacturing, construction, repair, or transportation	0%	1%	1%
Physical sciences, including mathematical sciences	3%	3%	3%
Public administration, legal, social, and protective services	2%	4%	2%
Social sciences	8%	6%	8%
Other major	10%	11%	10%
Undecided	2%	1%	2%

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Appendix: Participating Institutions

Aalto University
Abilene Christian University
Adams State University
Appalachian State University
Arcada University of Applied Sciences
Arcadia University
Baker University
Bluefield College
Broward College
Butler University
California State University, Chico
California State University, Dominguez Hills
Centria University of Applied Sciences
Chadron State College
Chandler-Gilbert Community College
Clemson University
Cleveland State Community College
Collin County Community College District
Coppin State University
Eastern Kentucky University
Eastern Michigan University
Eastern New Mexico University
Embry-Riddle Aeronautical University
Embry-Riddle Aeronautical University–Prescott
Embry-Riddle Aeronautical University–Worldwide
Estrella Mountain Community College
Fordham University
Forman Christian College University
Fort Lewis College
Franklin W. Olin College of Engineering
GateWay Community College
Georgia College & State University
Glendale Community College
Haaga-Helia University of Applied Sciences
Hame University of Applied Sciences (HAMK)
Helsinki Metropolia University of Applied Sciences
HUMAK University of Applied Sciences
Humber Institute of Technology & Advanced Learning
Ithaca College
JAMK University of Applied Sciences
Kajaani University of Applied Sciences
King University
Lahti University of Applied Sciences
Lapland University of Applied Sciences
Lappeenranta University of Technology
Laurea University of Applied Sciences
Louisiana State University
Loyola Marymount University
Marshall University
Mesa Community College
Messiah College
Metropolitan College of New York
Michigan State University
Middle East Technical University
Montana State University
Montgomery County Community College
Muskingum University
National Defence University
New Jersey Institute of Technology
North Carolina Central University
Northern Illinois University
Northern State University
Northwestern University
Oakland University
Oulu University of Applied Sciences
Pacific University
Palm Beach State College
Paradise Valley Community College
Pellissippi State Community College
Penn State Abington
Penn State Altoona

Penn State Beaver	The University of Memphis
Penn State Berks	The University of South Dakota
Penn State Brandywine	Truman State University
Penn State DuBois	University of Arkansas
Penn State Erie, The Behrend College	University of Cape Town
Penn State Fayette, The Eberly Campus	University of Central Florida
Penn State Greater Allegheny	University of Delaware
Penn State Harrisburg	University of Eastern Finland
Penn State Hazleton	University of Jyväskylä
Penn State Lehigh Valley	University of Kentucky
Penn State Milton S. Hershey Medical Center College of Medicine	University of Lapland
Penn State Mont Alto	University of Mary Hardin-Baylor
Penn State New Kensington	University of Maryland
Penn State Schuylkill	University of Maryland, Baltimore County
Penn State Scranton	University of Michigan–Ann Arbor
Penn State Shenango	University of Michigan–Dearborn
Penn State Wilkes-Barre	University of Missouri
Penn State World Campus	University of Missouri–Kansas City
Penn State York	University of Nevada, Las Vegas
Phoenix College	University of New Mexico
Portland State University	University of North Carolina, Pembroke
Rio Salado College	University of North Carolina, Wilmington
Saimaa University of Applied Sciences	University of North Dakota
Saint Mary's University	University of Northern Iowa
Salt Lake Community College	University of Notre Dame
Satakunta University of Applied Sciences	University of Oulu
Sauk Valley Community College	University of Pretoria Faculty of Economic and Management Sciences
Savonia University of Applied Sciences	University of Pretoria Faculty of Education
Scottsdale Community College	University of Pretoria Faculty of Engineering, Built Environment and Information Technology
Seinajoki University of Applied Sciences	University of Pretoria Faculty of Health Sciences
South Mountain Community College	University of Pretoria Faculty of Humanities
St. John's University	University of Pretoria Faculty of Law
Stony Brook University	University of Pretoria Faculty of Natural and Agricultural Sciences
Tampere University	University of Pretoria Faculty of Theology and Religion
Tampere University of Applied Sciences	
Texas Lutheran University	
Texas Woman's University	
The Pennsylvania State University	

University of Pretoria Faculty of Veterinary Science
University of Richmond
University of Texas at San Antonio
University of Texas Rio Grande Valley
University of Trinidad and Tobago
University of Turku
University of Washington
University of Wisconsin–Superior
Virginia Tech
Walsh College of Accountancy & Business
Wayne State University
West Chester University of Pennsylvania
Western Carolina University
Western Washington University
William Paterson University of New Jersey
Winona State University

Notes

1. Nathan D. Grawe, “How Demographic Change Is Transforming the Higher Ed Landscape,” *Higher Ed Jobs*, February 18, 2019; Eric Hoover and Beckie Supiano, “A Population in Flux Forces Colleges to Adapt,” *Chronicle of Higher Education*, December 16, 2016.
2. Ted Mitchell, “Changing Demographics and Digital Transformation,” *EDUCAUSE Review* 54, no. 1 (Winter 2019), 10–17.
3. We take our definition of “blended” from the work of Means, Bakia, and Murphy, who contend that the forms of blended learning “encompass all of the middle ground in the spectrum between fully face-to-face and fully online instruction.” See Jeffrey Pomerantz, Malcolm Brown, and D. Christopher Brooks, *Foundations for a Next Generation Digital Learning Environment: Faculty, Students, and the LMS*, research report (Louisville, CO: ECAR, January 2018); Barbara Means, Marianne Bakia, and Robert Murphy, *Learning Online: What Research Tells Us About Whether, When and How* (New York: Routledge, 2014), 7.
4. Students were asked the open-ended question, “What is the ONE thing you would like your instructors to do with technology to enhance your academic success?”
5. Christopher Phillips, “Online Course Accessibility to Benefit Everyone,” *EDUCAUSE Review*, September 28, 2018.
6. Respondents were first asked how frequently, if at all, they had used nine online success tools provided by their institution. Only students who responded that they had used the service(s) were directed to the question that asked them to rate the usefulness of the services they used.
7. The tools “Self-service systems for tracking credits, transfers, and dual enrollments” and “Self-service referral systems to social and community resources” were not included in the 2017 student survey but were added to the list of tools in the 2018 survey instrument.
8. Gregg Henriques, “The College Student Mental Health Crisis (Update),” *Psychology Today*, November 18, 2018.
9. John O’Brien, “Making the Case for Student Success Technology,” *EDUCAUSE Review*, September 24, 2018.
10. Alexander Mayer, Hoori Santikian Kalamkarian, Benjamin Cohen, et al., “Integrating Technology and Advising: Studying Enhancement to Colleges’ iPass Practices,” MDRC, July 2019.
11. Ibid.
12. Jean Dimeo, “Data Dive: Georgia State’s Extensive Predictive Analytics Efforts Are Leading to Better Grades and Student Retention—and More Minorities Graduating from STEM Programs,” *Inside Higher Ed*, July 19, 2017.
13. Jill Barshay and Sasha Aslanian, “Colleges Are Using Big Data to Track Students in an Effort to Boost Graduation Rates, but It Comes at a Cost,” *The Hechinger Report and American Public Media*, August 6, 2019.
14. D. Christopher Brooks, *ECAR Study of Undergraduate Students and Information Technology, 2016*, research report (Louisville, CO: ECAR, October 2016), 17–18.

15. Chris Hayhurst, "[Colleges Optimize Traffic on Busy Residence Hall Networks](#)," *EdTech*, October 12, 2018.
16. Ibid.
17. Dan Tynan, "[Colleges Tackle the Great Outdoors in Campus Wi-Fi Upgrades](#)," *EdTech*, October 11, 2018.
18. Mark Lieberman, "[Students Are Using Mobile Even If You Aren't](#)," *Inside Higher Ed*, February 27, 2019; A. J. Magda and C. B. Aslanian, [Online College Students 2018: Comprehensive Data on Demands and Preferences](#) (Louisville, KY: The Learning House, Inc., 2018).
19. Ryan Seilhamer, Baiyun Chen, Sue Bauer, Ashley Salter, and Luke Bennett, "[Changing Mobile Learning Practices: A Multiyear Study 2012–2016](#)," *EDUCAUSE Review*, April 23, 2018.
20. Goldie Blumenstyk, "[More Professors Know about Free Textbook Options, but Adoption Remains Low](#)," *Chronicle of Higher Education*, July 26, 2016; Ben Gose, "[Growing Pains Begin to Emerge in Open-Textbook Movement](#)," *Chronicle of Higher Education*, April 9, 2017.
21. Lindsay McKenzie, "[Pearson's Next Chapter](#)," *Inside Higher Ed*, July 16, 2019; Bill Rosenblatt, "[Pearson's Digital-First Strategy Will Change How Students Get Textbooks](#)," *Forbes*, July 20, 2019.
22. Joseph D. Galanek, Dana C. Gierdowski, and D. Christopher Brooks, [ECAR Study of Undergraduate Students and Information Technology, 2018](#), research report (Louisville, CO: ECAR, October 2018).
23. Thomas Hutcheon, Aileen Lian, and Anna Richard, "[The Impact of a Technology Ban on Students' Perceptions and Performance in Introduction to Psychology](#)," *Teaching of Psychology* 46, no. 1 (2019), 47–54; Thomas Hutcheon, "[E-xcellence in Teaching Essay: Technology Bans and Student Experience in the College Classroom](#)," *Society for the Teaching of Psychology*, September 7, 2017.
24. Derek Bruff, "[Thin Slices of Learning](#)," chapter 3 in [Intentional Tech: Principles to Guide the Use of Educational Technology in College Teaching](#) (Morgantown: West Virginia University Press, 2019).
25. Douglas A. Parry, Daniel B. le Roux, and Laurenz A. Cornelissen, "[Managing In-Lecture Media Use: The Feasibility and Value of a Split-Class Policy](#)," *Journal of Computing in Higher Education*, June 24, 2019.
26. Jessica Phillips, "[5 Tips for Accessibility and Universal Design for Learning](#)," *EDUCAUSE Review*, February 9, 2018; Aaron S. Richmond and Jordan D. Troisi, "[Technology in the Classroom: What the Research Tells Us](#)," *Inside Higher Ed*, December 12, 2018.
27. Lieberman, "[Students Are Using Mobile](#)."
28. [Video: Dr. Jaye Goosby Smith on the Difference Between Diversity and Inclusion](#), Charleston CEO, December 5, 2016.
29. See the EDUCAUSE Learning Initiative's [2019 Key Issues in Teaching and Learning](#), [2018 Key Issues in Teaching and Learning](#), [2017 Key Issues in Teaching and Learning](#), and [2016 Key Issues in Teaching and Learning](#).
30. Ratings of good and excellent for overall technology experience were lower for students with physical disabilities (70%), learning disabilities (69%), and both physical and learning disabilities (71%) compared with ratings for their peers who do not have a disability (80%).

31. In a sub-study of the National Longitudinal Transition Study-2, it was found that only 40% of post-secondary students who had previously received disability services in secondary school chose not to disclose their disability to their college or university. See Lynn Newman, “Postsecondary Education Participation of Youth with Disabilities,” in *After High School: A First Look at the Post-School Experiences of Youth with Disabilities*, A Report from the National Longitudinal Transition Study-2 (NLTS2), eds. Mary Wagner, Lynn Newman, Renée Cameto, Nicolle Garza, and Phyllis Levine (Menlo Park, CA: SRI International, 2005).
32. Derrick Kranke, Sarah E. Jackson, Debbie A. Taylor, Eileen Anderson-Fye, and Jerry Floersch, “College Student Disclosure of Non-Apparent Disabilities to Receive Classroom Accommodations,” *Journal of Postsecondary Education and Disability* 26, no. 1 (2013), 35–51; Laura Marshak, Todd Van Wieren, Dianne Raeke Ferrell, Lindsay Swiss, and Catherine Dugan, “Exploring Barriers to College Student Use of Disability Services and Accommodations,” *Journal of Postsecondary Education and Disability* 22, no. 3 (2010), 151–165; Julie R. Alexandrin, Ilana Lyn Schreiber, and Elizabeth Henry, “Why Not Disclose?” in *Pedagogy and Student Services for Institutional Transformation: Implementing Universal Design in Higher Education*, eds. Jeanne L. Higbee and Emily Goff (Minneapolis: University of Minnesota, 2008), 377.
33. Yvonne Tevis, “Adapting Technology and Building an Accessibility Community at the University of California,” *EDUCAUSE Review*, March 25, 2019.
34. Phillips, “5 Tips for Accessibility and Universal Design for Learning.”