



ECAR Study of Faculty and Information Technology, 2017

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Foreword

Postsecondary instruction in 2017 often involves—and even depends upon—a staggering array of sophisticated technologies and complex systems, some of which faculty may or may not fully understand how to use or even wish to use. For the third edition of our study of faculty and information technology, ECAR has sought to map and understand faculty use and perceptions of these campus- and classroom-based technologies and systems. Drawing on responses from thousands of faculty members across dozens of U.S. institutions, this report offers a rich and challenging contribution to the higher education field’s developing understanding of faculty engagement with and use of technology.

It is clear from this report that faculty have critical roles to play in shaping the experience of campus technology for their students and other faculty, and that in some ways faculty are embracing and thriving in these roles. It is also clear, however, that in other ways faculty are struggling to accommodate the preferences and requirements of an increasingly high-tech student body. Among the important findings put forth in this report, we are faced with the possibility that faculty optimism about the benefits of technology-based instruction may lag far behind the optimism of the students they teach. And when faculty are not optimistic about the benefits of certain instructional technologies, they tend not to engage in the teaching modalities that use those technologies, resulting in a gap between student needs and faculty practice. In a postsecondary environment that will likely only continue to become more digitized, awareness and understanding of faculty skepticism about and even resistance to new educational technologies will be critical for future pedagogical effectiveness and student learning outcomes.

It is my sincere hope that faculty, institutional leaders, and other higher education professionals will engage deeply with this year’s ECAR faculty report and that this report will enlarge institutions’ and higher education leaders’ understanding and resourcing of faculty’s technology-based needs and practices. I also strongly encourage readers of this report to read ECAR’s companion report on students and technology, *ECAR Study of Undergraduate Students and Information Technology, 2017*. The shifting balance of faculty and student 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

This report is the third study of faculty and information technology to be conducted by ECAR. 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 how faculty are using technology in service to their teaching and research. And although higher education IT organizations are the primary audience for this report, we think that many other stakeholder groups can make use of the findings and recommendations presented here as well, including those who run faculty and professional development programs; instructors drawn from every type of institution, discipline, and level of experience; student affairs professionals; and of course faculty members themselves.

In this year's study of faculty and IT, we have elected to present and discuss only findings that have analogs in this year's companion study of undergraduate students and IT. In both this report and the student 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 instructors and their students.

Understanding how faculty relate to and use educational technologies, and what they think about their IT services, is essential to meeting instructional technology and research computing demands. In this third edition of the faculty study, 13,451 respondents from 157 institutions in 7 countries (including the United States) and 37 U.S. states participated in the research. The quantitative findings in this report were developed using the 11,141 survey responses from faculty at 131 U.S. institutions. All types of faculty were invited to participate: part-time and full-time faculty; teaching and research faculty; faculty working

with undergraduates, graduates, and professionals; tenured and nontenured faculty; and all levels of academic rank (e.g., full, associate, and assistant professors; lecturers, adjuncts, and instructors).

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, by combining the findings reported here about faculty with ECAR's findings about undergraduate students, 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 faculty use of IT on campus but only the beginning.

Key Findings

- **Faculty are quite happy with the technology and support provided by their institution.** Those faculty who seek technical support from their institution's help desk are the most satisfied. Teaching and research assistants are also a valuable source of informal tech support to faculty.
- **Technology training offered to faculty is an opportunity to “train the trainers.”** When seeking technology support, faculty prioritize information sources that they perceive as signifying expertise. Faculty seek technology support from their institution's help desk first, then figure it out themselves, then ask colleagues.
- **Faculty are critical to raising awareness among students about technology training offered to students.** Such technology training is critical for student success. About half of faculty believe that their students are prepared to use institutionally specific technology, though fewer than half of students believe this of themselves. This is a major point of failure for students but one that can be overcome by the institution's identifying students' most critical training needs and faculty's raising awareness of available training.
- **Faculty have confidence in their institution's ability to safeguard their data and that of their students.** The institution's actions to safeguard this data, however, are largely invisible to faculty. Nevertheless, there has been a jump since the previous faculty survey in the degree to which faculty claim to understand their institution's policies about data use, storage, and protection, which may indicate the success of efforts by campus IT units to communicate policies.
- **Many faculty buy their own personal computing devices.** Most institutions provide faculty with a laptop or a desktop, yet many faculty additionally buy themselves a personal laptop, and nearly all faculty own a personal smartphone. These high ownership rates for personal devices, which are presumably used on campus at least sometimes, raise the potential for security risks to the institution's network.
- **Despite the increasingly widespread use of student success management systems in higher education, many faculty do not use them.** This, despite these systems' potential to inform faculty members' teaching and advising. This may point to faculty concerns about the functionality of such systems.

- **The LMS that is implemented at an institution has little impact on faculty members' use of it or their satisfaction with that use.** Faculty use their institution's LMS at high rates but mostly only for operational, course management functions like circulating information such as the syllabus, handouts, and assignments. Faculty satisfaction with these operational, course management functions of their institution's LMS is high and varies little across different LMSs.
- **Faculty have a love-hate relationship with online teaching and learning: They don't want to do it but think they would be better instructors if they did.** Most faculty agree that online learning makes higher education available to more students, but few agree that online learning helps students learn more effectively. Faculty predominantly teach courses with no or only some online components, and this is how faculty members prefer to teach courses. Yet most faculty believe that they could be more effective instructors if they were better skilled at integrating various technologies into their courses. Media-production software and open educational resources (OER) top this list. In other words, faculty say that they do not want to teach online and do not believe it helps students learn more effectively, but when asked about the tools and technologies that enable online learning, faculty believe that their teaching would be improved by their use.
- **Faculty are self-selecting into the teaching modalities that they believe in.** Of faculty who prefer to teach entirely face to face, most do not believe that online learning helps students learn more effectively. Of faculty who prefer to teach completely online, however, most agree that it does.
- **The greater a faculty member's skill in classroom management, the more likely the faculty member is to encourage or require students to use devices in the classroom.** A large percentage of faculty either discourage or outright ban computing devices of all types from their classroom. Older faculty members with a greater number of years in a faculty position, however, are less likely to establish such a policy. With age and experience in a faculty position, of course, generally comes greater skill in classroom management.

General Experience of IT on Campus

Overall Technology Experience

Faculty are, by and large, quite happy with the technology and support at their institution. In response to a question asking faculty to describe their overall technology experience at their institution,¹ 71% of respondents rated their experience as good or excellent and only 16% as fair or poor, as shown in figure 1.

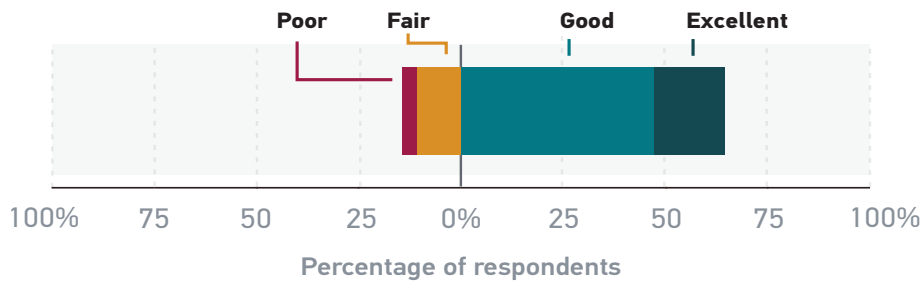


Figure 1. Faculty’s overall experience of technology at the institution

Respondents at associate’s and bachelor’s institutions are significantly more satisfied with the technology and support at their institution than respondents at master’s and doctoral institutions. The reason for this is not clear. As will be discussed below, no Carnegie class of institutions is more likely than any other to provide computing devices to their faculty, nor are faculty at any specific class of institution much more likely to use their institution’s IT help desk. Somewhat more surprisingly, there were no significant differences in the level of satisfaction between full- and part-time faculty or among different academic ranks.

Faculty members’ level of satisfaction with the technology experience at their institution does, however, vary by where they go for technology support. Faculty who seek technical support from the institution’s help desk are the most likely (76%) to rate their overall technology experience at their institution as good or excellent, while faculty who seek technical support from their friends or their students are the most likely (20%) to rate their overall technology experience at their institution as fair or poor. Note that in the “Technical Support” section, below, it is reported that the help desk topped the list for where faculty seek technical support; “Ask friends” was near the bottom. “Ask teaching or research assistants” was at the very bottom of the list, though most faculty who seek technical support from those individuals rate their overall technology experience at their institution as good or excellent (71%). This last finding may indicate a partly hidden function of teaching and research assistants as more or less informal providers of tech support to faculty. It might benefit institutional IT

departments to reach out to and provide technology training to teaching and research assistants in an effort to “train the trainers.” Any such training that teaching and research assistants receive is likely to benefit faculty later.

Technical Support

Respondents were asked: “When you need technology support or assistance for work-related activities, what do you typically do?” A list of nine items was provided, and respondents could select up to three. The first thing to notice about figure 2 is the two very clear groups of responses: Nearly half to three-quarters of respondents selected the items in the first group, while fewer than 10% of respondents selected the items in the second group. These two groups are clearly distinguished by their relative levels of perceived expertise. It is not clear in what order faculty seek information from these sources, what sources they consult first, second, third, etc. Nevertheless, most faculty seek information from sources that they perceive as having expertise, such as their institution’s IT help desk, their colleagues, or themselves. All other information sources come in a distant second.

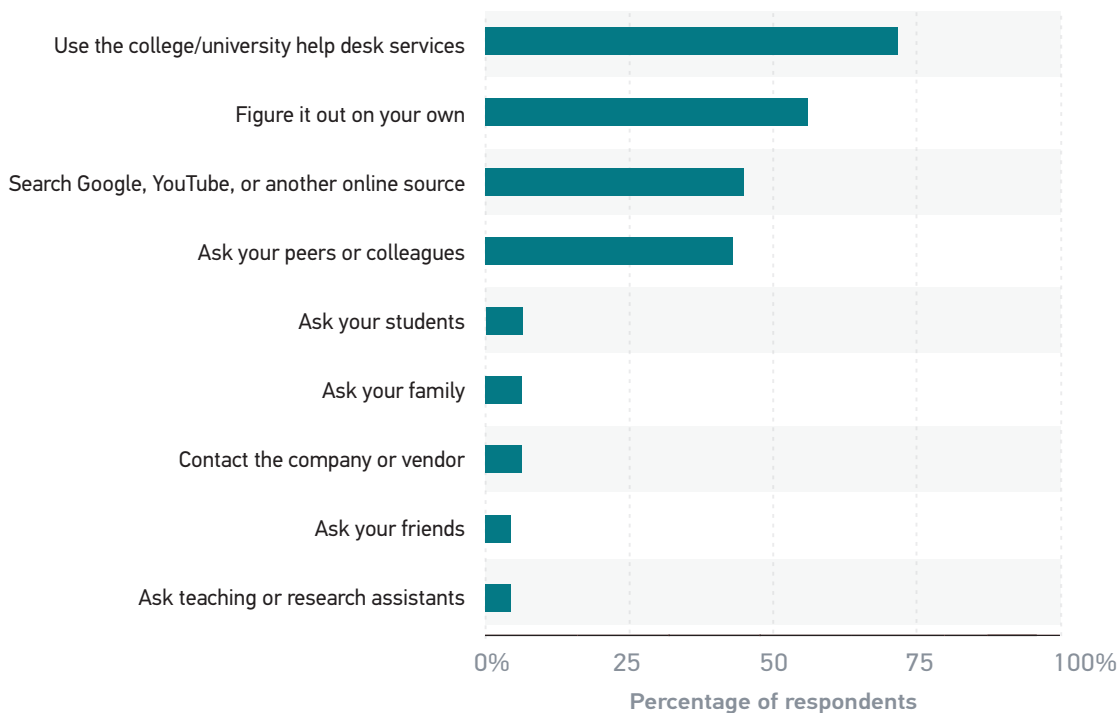


Figure 2. Where faculty seek technology support²

Faculty, of course, operate in a reputation economy in which reputation is largely based on expertise. So it is no surprise that faculty prioritize information sources

that they perceive as signifying expertise and deprioritize other sources.³ A faculty member's perception of expertise may be incorrect: Students or research assistants, for example, may in fact have quite a bit of knowledge about certain IT issues, and a company may be the best source of information about its product; but that is not the point. While an information seeker may fail to appreciate the existence of an information source, perception is reality here: Faculty prioritize sources of perceived expertise, particularly when that source of expertise is themselves or their colleagues. Decades of research exists on information-seeking behavior and the information search process,⁴ much of which shows that the principle of least effort applies to information seeking,⁵ as it does in so many other arenas. It is possible to move beyond simple satisficing in information seeking, but this requires experience.⁶ Faculty, of course, gained that experience thanks in part to years of training in graduate school, and thus it has become second nature for faculty to rely on and trust expertise.

These findings have clear implications for institutions' IT help desks. Many help desks are in libraries or other locations that are intended to be convenient for students. However, a far greater percentage of faculty than students use their institution's help desk.⁷ It is not clear from this survey how faculty are making use of the help desk, but it seems likely that more faculty members' use is mediated (phone, e-mail, etc.) than in person (at the desk). Therefore, campus IT units need not necessarily gear their help desk service toward faculty but should at least provide significant support to faculty for the types of issues that they are likely to encounter (e.g., assistance with LMS functionality, connecting to institution-provided services while traveling). At many institutions, IT support is distributed across academic units—a hybrid of centralized and decentralized;⁸ these local help desks are in a good position to develop customized support services.

These findings also have clear implications for faculty themselves. Any help that a faculty member receives from the help desk, or training from any source, not only helps that faculty member individually but also potentially helps that faculty member's colleagues later. The IT units in institutions of higher education would therefore do well to provide and promote training to faculty. Such training or workshops will not only directly benefit the recipients but are also an opportunity to "train the trainers," as faculty are likely to pass their knowledge along to their colleagues.⁹

Information Security at the Institution

One type of training that IT units provide to everyone at the institution is on information security. Respondents were asked a series of questions about this type of training. The first of these questions was whether the institution provides information security training, either mandatory or optional. The findings from

this question were perhaps the most staggering of this entire series: As shown in figure 3, fully 48% of faculty *do not know* if their institution provides information security training.

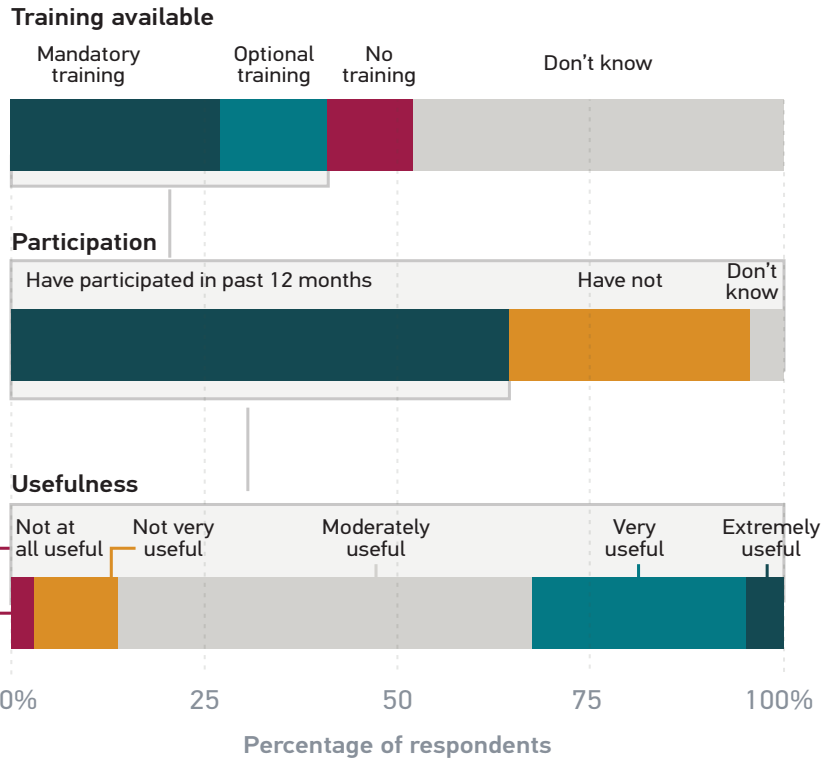


Figure 3. Faculty perception of institutional information security training

Respondents who answered in the affirmative, for either mandatory or optional training, were then asked whether they had participated in this training in the past 12 months. Approximately a third of respondents whose institution offers information security training have not participated in it in the past 12 months, while two-thirds have. This breaks down further: 81% of respondents whose institution’s information security training is mandatory have participated in this training in the past 12 months, but only 30% of those whose institution only offers optional information security training have. Unsurprisingly, if information security training is optional, then most faculty members will not participate. It is also possible, of course, that some institutions do not require information security training for faculty every year, so even if it is mandatory, some respondents may not have participated in the past 12 months. Yet a third possibility is that faculty simply may not feel that they need information security training.

Respondents were asked a small set of questions about their level of confidence in their institution’s information security practices and its ability to safeguard a

variety of types of information.¹⁰ By and large, faculty have a great deal of trust in their institution's information security practices: Between two-thirds and three-quarters of respondents agreed or strongly agreed that they have confidence in their institution's ability to safeguard information. This is consistent with the results of the 2015 faculty survey,¹¹ with one notable exception: A far greater percentage of respondents (an increase of nearly 30 percentage points) agreed or strongly agreed that they "understand relevant university policies" about data storage in 2017 than did so in 2015. This speaks well of efforts by campus IT units to communicate policies over the past two years.

Perhaps the most important finding from this set of questions, however, is that 63% of faculty disagreed or strongly disagreed that their institution's security policies impede their productivity. In other words, institutional security policies are more or less invisible to most of our respondents. This finding could be read as indicating that faculty have confidence in their institution's information security practices as long as the policies that enable them are more or less invisible. Furthermore, as long as their institution's security policies are invisible, faculty do not believe that they need training in these policies.

Returning now to the questions about information security training, respondents who answered that they had participated in their institution's information security training in the past 12 months were asked a third question: How useful was this training?¹² Perhaps unsurprisingly, the most common response to this question (54%) was the midpoint of the scale, "Moderately useful." However, approximately a third of respondents found this training very or extremely useful.

Finally, respondents who answered that their institution's information security training was not very useful or not at all useful were asked a final, open-ended question: How can your institution make information security training more useful? As might be expected, since only those who responded to the previous question negatively were asked, the responses to this question were quite negative. Nevertheless, these responses yielded some useful and actionable advice. One prevalent theme in these responses was a sometimes quite intense dislike of third-party training videos. In some cases, respondents indicated that these videos were outdated, which significantly blunted the impact of their message. Some respondents indicated that the information in these videos was common sense (such as how to create secure passwords¹³) and thus came across as condescending. Several respondents suggested that written documents could convey the same information in less time and less irritatingly. Many more suggested that live training sessions, offered in person and in a classroom, would be far better received.

An equally important theme in these responses was customizing the training for the institution, for the discipline, and for the types of data collected by and activities being performed by the faculty member.¹⁴ Many respondents suggested that the training was too general to be useful and that they would appreciate

specific recommendations for tools they can use, beyond simply installing the institution’s enterprise-scale security software suite. They wanted specific policies that they can follow in specific contexts, and information on how to identify security concerns such as fraudulent e-mail and security breaches. A few respondents found the training too technical, though a far greater number wrote that, as experienced technology users, they found it too simple. Many of these respondents suggested that there should be more advanced levels of training and that one should be able to opt out of more basic levels. Several respondents were clearly faculty in humanities disciplines because a small but important theme that emerged was that much of this training is oriented toward securing research data and has little to say about the more creative work that might be produced by faculty in, for example, a creative writing or graphic arts department. These examples emphasize the need for institutions (or for organizations from which institutions license or purchase such training) to customize information security training, not merely to keep the content relevant and up to date but to ensure that the message of the training is heard at all.

Device Ownership

IT is integrated into nearly every aspect of higher education, so it is critical for faculty to have access to devices for their personal and professional use. Respondents were asked if they personally own, or if their institution provides them with, any of a small set of common types of devices.¹⁵ Figure 4 shows a finding similar to what ECAR found in 2015, that laptops continue to be the workhorse for faculty, with fully 97% of faculty having one (combining both those provided by the institution and those personally owned).¹⁶ Desktops aren’t far behind, with 85% of faculty having one (again, combining institutional and personal ownership). Those laptops and desktops are provided by the institution to more than half of our respondents, with desktops having the edge over laptops (61% to 51%). The percentage of respondents’ institutions that provide laptops is up slightly from the 2015 faculty study.¹⁷



Figure 4. Provider of the devices that faculty use most

Figure 5 shows data on which of these same devices faculty personally own. To read this figure, follow the arrows from the devices diagonally across and down. Most cells in this grid are an intersection: 5% of faculty personally own both a desktop and a smartphone, 12% of faculty own both a laptop and a smartphone. Fully 26% of faculty own all four devices, and 22% own a laptop, a smartphone, and a tablet. Fewer than 1% of faculty own only a tablet, and, somewhat surprisingly, 3% of faculty own no devices at all.



Figure 5. Personal technology ownership

While no Carnegie class of institutions is more likely than another to provide devices to their faculty, there was some variation across disciplines. Faculty in disciplines that are traditionally vocational but with the advent of data science are becoming increasingly computerized (e.g., agriculture and natural resources; and manufacturing, construction, repair, and transportation) are the most likely to have desktops and laptops provided by their institution, while faculty in the humanities (e.g., liberal arts, fine and performing arts) are the least likely. Somewhat surprisingly, disciplines generally thought of as requiring high-performance computing (e.g., computer science and engineering) were solidly in the middle of this list. This latter finding may reflect the fact that these disciplines do require high-performance computing and therefore some faculty in those

disciplines may provision their own hardware through grant funding rather than work with an institutional standard device inadequate to their computing needs.

The predominant operating system on devices owned by faculty is Windows (75% of desktops, 63% of laptops), though there is a solid contingent of Mac users (21% of desktops, 33% of laptops). Linux and Chrome OS have small but presumably very loyal user bases: Linux accounts for 2% of desktops and 1% of laptops, while Chrome OS accounts for 2% of both.

Many faculty buy their own personal laptops despite being provided with hardware by their institution. Of faculty who were provided with a desktop by the institution, about 73% also own a personal laptop. Of faculty who were provided with a laptop by the institution, about 45% own *another* personal laptop. Depending on where the faculty member uses this personal laptop, and for what purposes, this raises the potential for security risks to the institution's network, as the personal laptop may not have installed whatever suite of security tools the institution provides.

The finding that more faculty personally own laptops than desktops is consistent with device ownership trends found in different contexts. The Pew Research Center found that in the United States at large, laptop ownership surpassed desktop ownership in 2011.¹⁸ That laptops are increasingly the preferred "heavy" device for personal ownership perhaps reflects the increasingly mobile nature of computing generally. This is borne out by the slight increase since the 2015 faculty survey in the percentage of faculty owning "light" devices such as tablets and smartphones. Smartphones in particular are becoming ubiquitous, with 93% of faculty personally owning one. Despite this, however, 22% of respondents say they are provided a tablet by their institution, while only 2% are provided a smartphone.

As discussed above, most institutions of higher education provide a laptop or a desktop to faculty. This makes sense, given that these devices remain more able than tablets and smartphones to support certain categories of complex applications, such as statistical analysis software; they also tend to be easier to use for production work, such as writing and grading papers. Given that the job of faculty involves a great deal of both writing and grading, institutional support for these "heavy" devices continues to make sense. But here there is an interesting crossover with the findings from the 2017 student study: Fully 83% of students used a smartphone for course-related activities for one or more of their courses, and 25% used a smartphone for *all* of their courses; two-thirds of students consider it very or extremely important to be able to use a smartphone for course activities. Given that students are so extensively using handheld devices for course activities, it may be worthwhile for institutions of higher education to consider providing (or sharing the cost of) such devices to faculty, so as to better enable faculty to support students on the platforms and in the environments where they are.

What Faculty Think about Students and IT

Perceptions of Students' Technology Literacy

Smartphones are nearly ubiquitous among students, as are laptops, and a majority of students use smartphones in their courses. Indeed, fully 98% of students own two or more Internet-capable devices. While owning a device does not necessarily mean that one knows what to do with it, faculty by and large have confidence in their students' technology literacy. Respondents were asked a small set of questions concerning their beliefs about their students' preparedness to use technology necessary for course-related activities. Figure 6 shows that two-thirds agreed or strongly agreed that their students are prepared to use commercial software applications (e.g., MS Office, Google Apps).

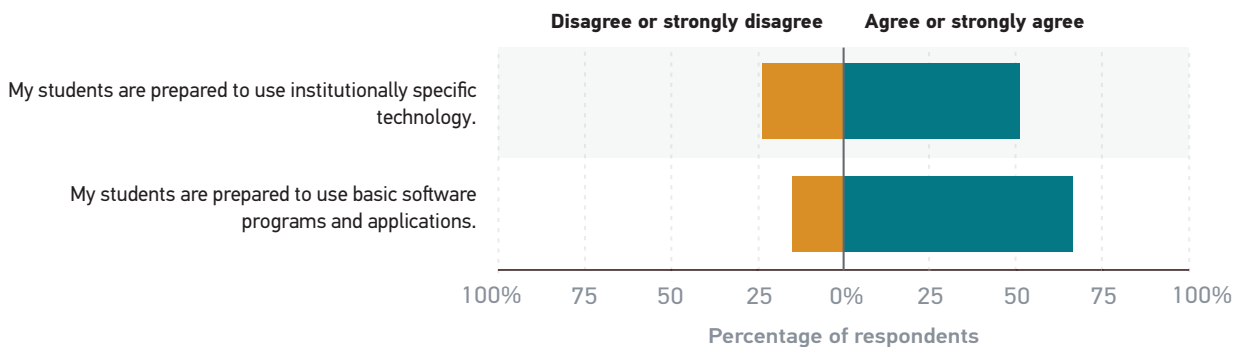


Figure 6. Faculty beliefs about their students' technology preparedness

On the other hand, only half of faculty agreed or strongly agreed that their students are prepared to use institutionally specific technology (e.g., the course registration system, the LMS). By comparison, fewer than half of students believe this of themselves. This could be interpreted as faculty succumbing, ironically, to “expert syndrome,” wherein faculty forget that not everyone knows what *they* know—in this case about how to use institutionally specific technology. Students, of course, and particularly new students, have not been at the institution long enough to gain the depth of experience that many faculty have with this technology.

Whatever the reasons for these beliefs, there is clearly a need for training to be offered to students in the use of both institutionally specific technology and commercial software. Whatever help students have received in using technology, it is not coming from their instructors, despite the fact that some faculty seem to think it is: 59% of faculty agreed or strongly agreed that their students look

to them or their teaching assistants for technology support. However, only 25% of students said that they ask their instructors, and only 6% ask their teaching assistants, for technology support for school-related activities.¹⁹

Taken together, these findings indicate a clear need for the institution's central IT unit or other appropriate unit on campus to offer such technology training to students. Many students, by their own admission, feel unprepared to use institutionally specific technology, and some even feel unprepared to use commercial software. Given that both categories of technology are critical to student success, this is a major point of failure for students. However, this is an area in which the institution can make significant inroads through a combination of identifying the most critical training needs among the student body at the institution and promoting training offerings to raise awareness and bring in those students most in need of them. Faculty, for their part, are critical to raising awareness of technology training on campus. By discussing these offerings in class, or better still by encouraging or even requiring students to attend training sessions, faculty have considerable power to improve student technology literacy.

Student Success Management Systems

Integrated planning and advising for student success (iPASS) tools were named one of the top strategic technologies by EDUCAUSE for the first time in 2017.²⁰ Driven by mandates for student success initiatives and data-driven decision making, such student success management systems (SSMSs)²¹ are fully deployed at only a handful of institutions, but many institutions are beginning to track and learn about them. Implementation of SSMSs is not just an IT project—it is a student success project that requires 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.

Students and faculty were asked a small set of similar questions about how useful they find a set of services that are common in student success management systems. This section compares and contrasts these responses.

The first thing to notice in figure 7 is that students evaluate the usefulness of all four SSMS services significantly higher than faculty do. The greatest difference between faculty and student ratings is for course suggestions, and it is perhaps unsurprising that students would find such a service more useful than faculty do.

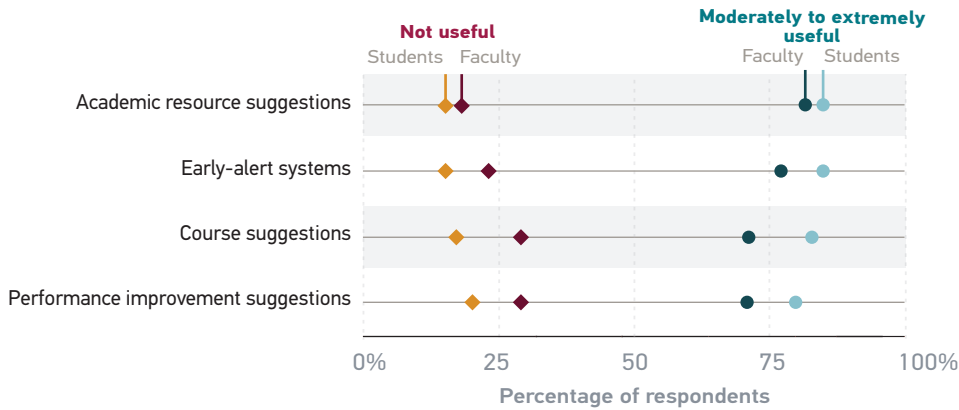


Figure 7. Student and faculty opinions of the usefulness of various SSMS services

What is not shown in figure 7 is the very large percentage of “Service not provided” and “Don’t use service” responses. Between 7% and 21% of students and between 16% and 28% of faculty do not have access to these services, while between 21% and 28% of students and between 23% and 34% of faculty have access but apparently choose not to use these services. The services that the greatest percentage of faculty choose not to use are course suggestions and performance improvement suggestions, services that might (if used) inform the faculty member’s advising. The service that faculty use the most is early-alert systems, which might inform the faculty member’s teaching.

The reason for such high rates of non-use of these SSMS services is unclear. If students and faculty know that a service is offered by an institution and have made a conscious decision not to use it, then this points to a serious problem with the implementation of these SSMS services. Why are students and faculty not using them when they have the potential to be so useful? Could it be that institutions did not secure the requisite buy-in from faculty and students when implementing these tools? Do these tools not provide the functionality users want? Are the user interfaces so poor (compared with those of Netflix, Amazon, and other common recommender systems) that users consider them unusable?²²

LMS

Use of the LMS

LMSs are universal in higher education, having achieved near-saturation of the market with nearly all institutions having at least one in place.²³ Therefore one might expect the LMS market to be quite mature, but this is not entirely the case. As Phil Hill has reported,²⁴ the LMS market has undergone a great deal of change over the course of two decades, and this change continues to this day as new products emerge and existing products merge. Looking across the 2014, 2015, and 2017 faculty studies, Canvas continues to gain market share, Blackboard continues to lose market share, and homegrown systems are similarly on the decline.

Regardless of the LMS that an institution uses, the uses to which faculty put the LMS are remarkably consistent both across institution types and across time. Pushing out information has been the most common use of the LMS across the 2014, 2015, and, as shown in figure 8, the 2017 faculty studies. In the 2017 study, this category was decomposed for the first time into a set of types of information that a faculty member might want to push out: the syllabus, handouts, and assignments. All three of these were among the most common uses of the LMS, with three-quarters or more of faculty using the LMS for those purposes. Rounding out the set of the most common uses of the LMS is the companion to pushing out assignments: using the gradebook.²⁵

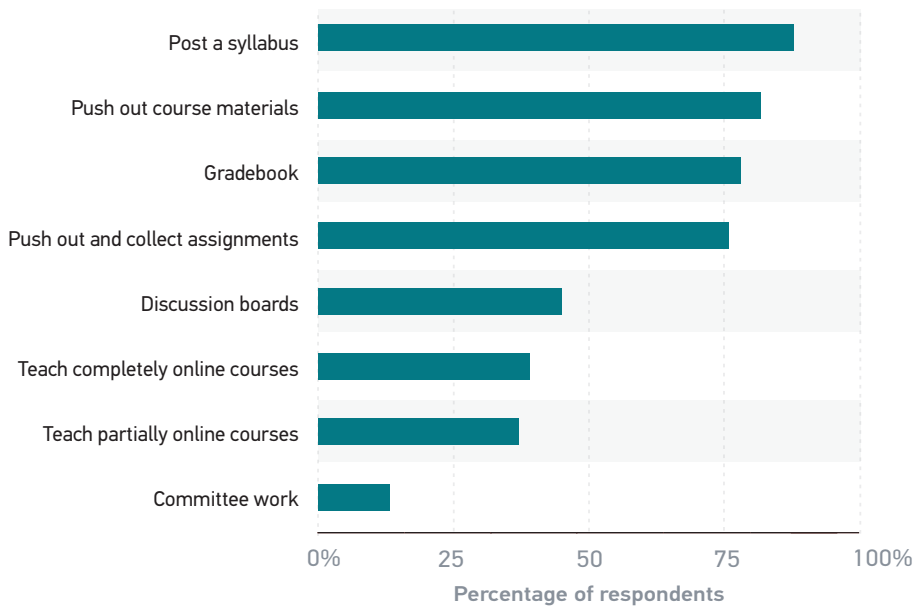


Figure 8. How faculty use the LMS

The most common faculty uses of the LMS are all operational, course management functions. These are functions that require little or no interaction between the instructor and the students. Even pushing out and collecting assignments and using the gradebook are asynchronous and do not necessarily involve interaction. Use of the discussion boards is necessarily interactive and is far less common. One might expect faculty who have taught more online courses to make greater use of the interactive functionality of the LMS, but somewhat surprisingly this was not the case.

Satisfaction with the LMS

No single LMS has emerged as dominant, as new products continue to emerge and existing products to merge. Even the fundamental questions of whether institutions opt for an in-house or a vendor-managed LMS²⁶ and whether that LMS is proprietary or open source²⁷ remain open. Yet LMSs are universal, with nearly all institutions having at least one in place,²⁸ and most LMSs have similar functionality.

Despite the ongoing changes in the LMS market and regardless of which LMS an institution uses, faculty satisfaction with LMSs and their functionality has changed little over time. Specifically, the findings about satisfaction with the LMS look remarkably similar across the 2014, 2015, and 2017 faculty studies: 60% of faculty were satisfied or very satisfied with their overall LMS experience in 2014,²⁹ 59% in 2015,³⁰ and 67% in the current study. And not only has overall faculty satisfaction with LMSs remained fairly consistent over time, but so has satisfaction with specific LMS functionality. Indeed, the order of items in figure 9—the percentage of faculty who are satisfied with each piece of LMS functionality—is nearly identical to that in the analogous figure in the report for the 2015 faculty study.³¹

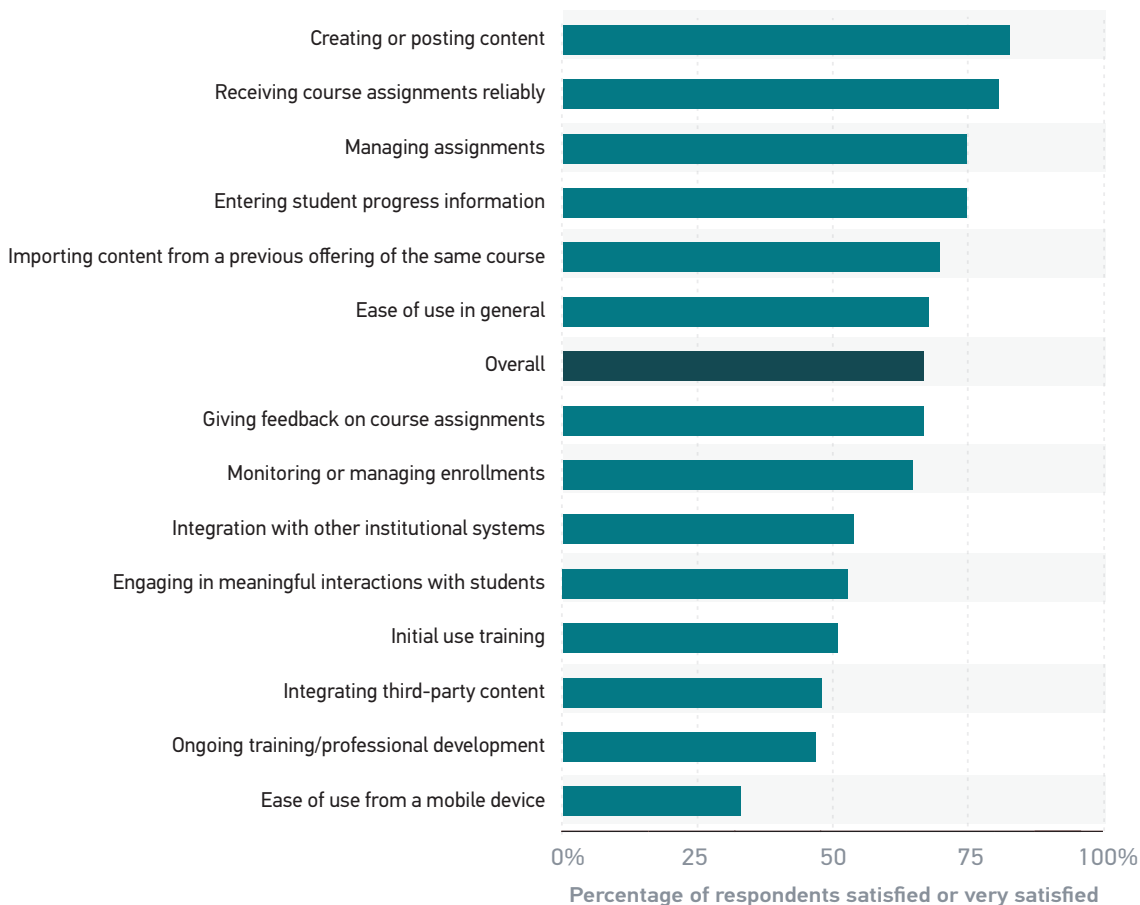


Figure 9. Faculty satisfaction with the various LMS functions

The LMS functions at the top of this list are the same as the most common uses to which faculty put the LMS, documented in the “Use of the LMS” section: pushing out content to students and receiving work back from students. As discussed in that section, these are operational, course management functions. The functions at the bottom of this list, on the other hand, are newer capabilities of LMSs for which demand is still growing and feature sets still emerging. “Ease of use from a mobile device” is critical for use of the LMS in the classroom. “Integrating third-party content” is critical if an instructor is using publisher-created content or OER, but awareness of OER among faculty remains low.³²

Perhaps the most surprising finding here, however, is that these findings vary little by the specific LMS. In other words, it does not seem to matter which LMS is implemented at an institution. Faculty satisfaction overall, and satisfaction with specific LMS functionality, is the same. There is still considerable change under way in the LMS market, but this does not appear to be having much effect

on either product differentiation or user satisfaction.³³ This seems to indicate that, at least in the eyes of faculty, LMSs have become infrastructure, analogous to the campus phone or e-mail system—a tool that faculty use for specific functionality without thinking much about how that functionality is implemented.

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.³⁴ 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.”³⁵ Next generation digital learning environments (NGDLEs) that address issues of interoperability; personalization; collaboration; accessibility and universal design; and analytics, advising, and learning assessment³⁶ are a relatively new concept that is beginning to get some attention and traction in higher education IT circles.³⁷

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,³⁸ 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 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 and whistles that never get used or used properly, and 3) lays the foundation for future adoption and use of NGDLEs. 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.

Teaching and Learning Environment

Online Teaching

Faculty were asked how many for-credit course sections they had taught in the past 12 months. Respondents who had taught zero course sections in the past 12 months must have been on leave or had bought out of their courses yet were still motivated to respond to our survey. (We thank you, whoever you are.) Perhaps unsurprisingly, most of those with the heaviest teaching loads are lecturers or instructors. The median number of course sections taught by respondents in the past 12 months was 6, which is a reasonable number for instructors at institutions where the academic calendar is based on either semesters or quarters. A follow-up question asked for the number of for-credit course sections respondents had taught in the past 12 months and the varying degrees of blendedness of face-to-face and online modalities.

There is no agreed-upon measure of blendedness. The Courseware in Context (CWIC) Framework and the OLC Blended Learning Scorecard articulate categories of the course environment that may be online. However, even these tools do not quantify the extent of blendedness of these categories. The distinction between these modalities is therefore quite fuzzy. That said, most course sections taught in the past 12 months were completely or mostly face to face, some were completely online, and few were blended to any significant extent. This perhaps indicates the fact that entirely online courses and programs are widespread in higher education but that faculty, by and large, are not providing their students in the classroom with a blended learning experience by using the tools available to them. Certainly this is true for the LMS, which, as discussed above, faculty use largely for operational, course management functions and very little for interactivity.

Opinions about Online Learning

By and large, faculty do not seem to have a very positive opinion of online learning. Faculty were asked the extent to which they agree with a small set of statements about online learning. As shown in figure 10, 79% of faculty agreed or strongly agreed that online learning makes higher education available to more students. But fewer than 50% of faculty agreed or strongly agreed with any of the other statements, and almost half of faculty disagreed or strongly disagreed that online learning helps students learn more effectively. Or, put differently, almost half of faculty believe that online learning has either no effect or a negative effect on student learning.

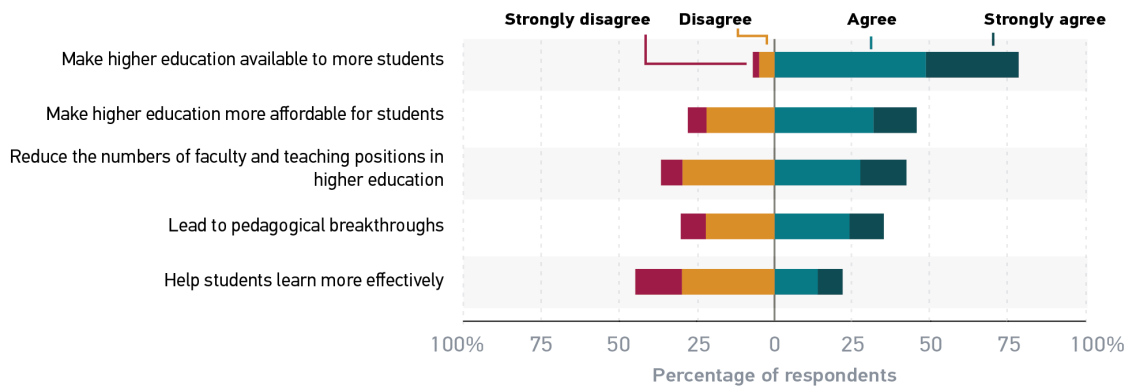


Figure 10. Faculty believe that online learning will ...

Faculty belief that online learning has either no effect or a negative effect on student learning is simply incorrect. Barbara Means and colleagues conducted a meta-analysis of a host of studies of online learning and found that fully online courses produced learning gains that are indistinguishable from those produced in fully face-to-face environments; in fact, they found that blended instruction has *stronger* learning outcomes than either online or face-to-face instruction alone.³⁹ The fact that faculty are either unaware of these findings about online learning or perhaps are unconvinced by them should be a call to arms for centers for teaching and learning at institutions with online courses or programs and for researchers evaluating efficacy research on educational technology.⁴⁰

Preference for Teaching Environment

Faculty were asked in what type of learning environment they prefer to teach. The findings from this question closely parallel those reported in the “Online Teaching” section, above, about the number of for-credit course sections of varying degrees of blendedness that faculty had taught in the past 12 months. Faculty members predominantly taught courses with no or only some online components, and they prefer to teach courses with no or only some online components. Correlation does not equal causation, but it is difficult to escape the suspicion that either faculty teach mostly courses in these modalities because they prefer them or that faculty prefer these modalities because they are familiar.

As discussed above, there is no agreed-upon measure of blendedness, so the distinctions between the categories in figure 11 are quite fuzzy. That said, it is clear that the vast majority of faculty prefer to teach in an environment that is blended to a greater or lesser extent, though mostly lesser. Nevertheless, this is a positive finding, given that, as discussed above, blended instruction has stronger learning outcomes than either mode alone.⁴¹

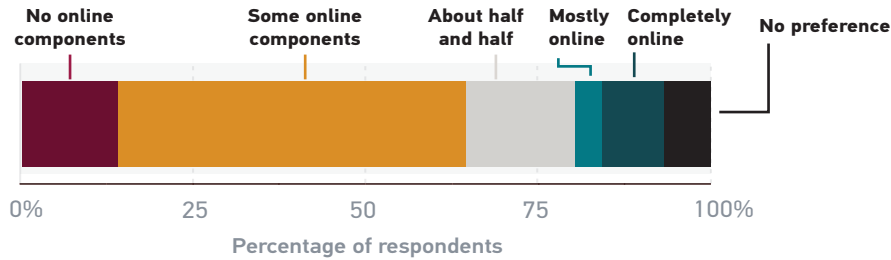


Figure 11. Faculty preference for teaching environment

Figure 11 shows that 9% of faculty prefer to teach in a completely online environment. Taking this finding side-by-side with the finding reported above that almost half of faculty believe that online learning has either no effect or a negative effect on student learning points to a division among faculty: Of faculty who prefer to teach in an environment with no online components, 70% disagreed or strongly disagreed that online learning helps students learn more effectively. On the other hand, of faculty who prefer to teach in a completely online environment, 59% agreed or strongly agreed that online learning helps students learn more effectively.⁴² In short, faculty seem to be self-selecting into the teaching modalities they believe in or for which they are rewarded by their institution or their discipline. Those who believe in the pedagogical power of online learning teach online, while those who don't, don't.

Integration of Technology into Teaching

Technology is ubiquitous in higher education and increasingly integrated into teaching and learning. Students say that they want more and better uses of technology in the classroom.⁴³ Given this student demand, it is critical to identify what factors can lead faculty to integrate more technology into their teaching.

Respondents were presented with a list of learning technologies and asked to rate their level of agreement with the statement “I could be a more effective instructor if I were better skilled at integrating this technology into my courses.”⁴⁴ These technologies spanned a wide range, from the nearly ubiquitous smartphones and LMSs to those currently occupying more of a specialized niche, such as educational games; and from commercial offerings such as publisher-created resources to free resources such as OER and content from the Khan Academy.

Figure 12 shows that between one-third and two-thirds of respondents agreed or strongly agreed that they could be more effective if they were better skilled at integrating every single one of the technologies listed into their courses. At the very top of the list, at 69%, is video- and multimedia-production software. This

is perhaps a result of the dramatic decrease in the cost and the increase in the availability and ease of use of video-editing software over the past few years. It is perhaps also a result of the hype around MOOCs over the past few years; while not having lived up to the hype in many ways, MOOCs have certainly raised the stakes for video production values in blended courses.⁴⁵ In 2016, the Gartner Hype Cycle for Education listed MOOC platforms as “On the Rise.”⁴⁶ This desire by faculty to have greater skill in video and multimedia production may be an indication that MOOCs, and perhaps the flipped classroom model more generally, have leapt straight to the “Slope of Enlightenment,” as good practices in creating educational video are evolving.

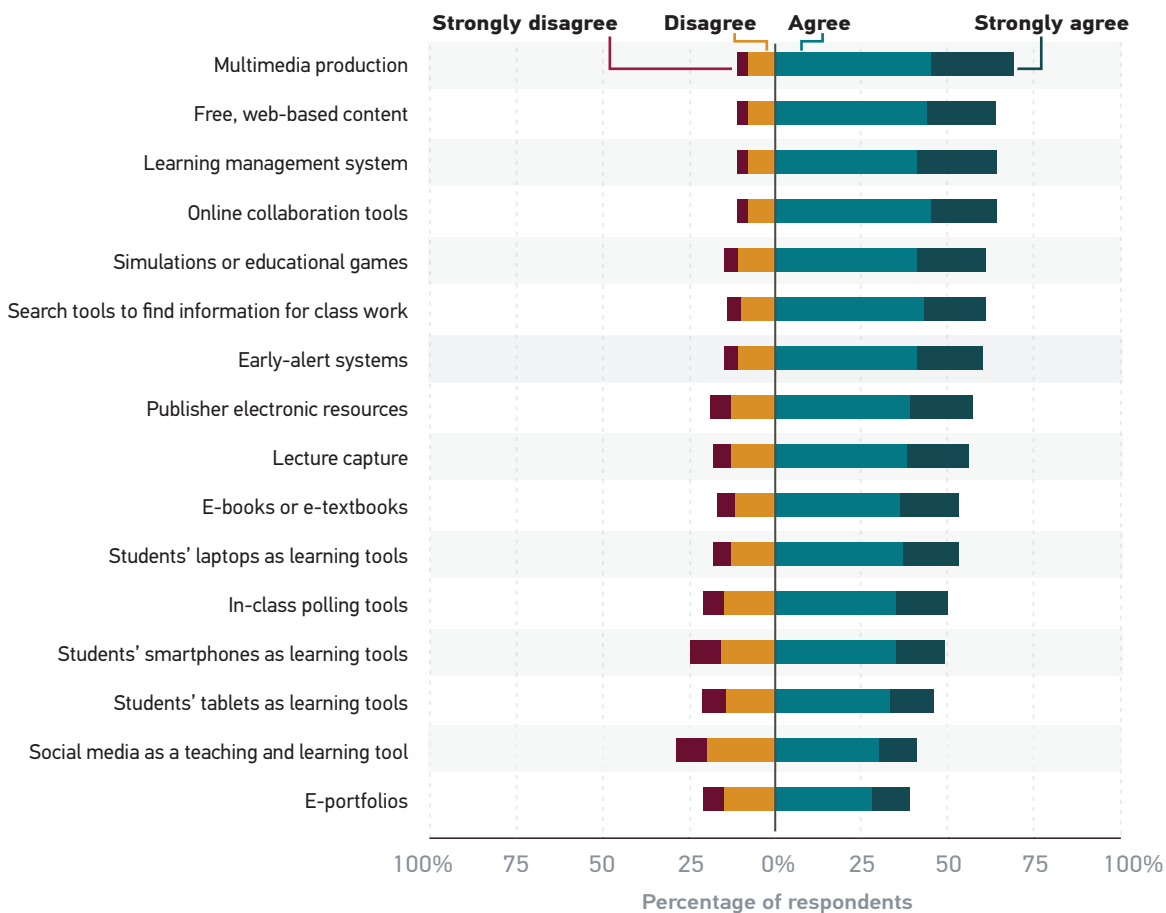


Figure 12. Faculty responses about whether greater skill with these technologies would make them more effective instructors

To the extent that the technologies in figure 12 contribute to blended learning, this finding somewhat contradicts the finding discussed above about faculty preference for teaching environments. Only a few of these technologies are

specifically learning environments in which faculty might teach, though those are very near the top of this list: the LMS, online collaboration tools, and educational games. All of these technologies, however, *enable* blended learning to some extent. It is therefore worth pointing out that when asked about the type of learning environment in which they prefer to teach, faculty members said they prefer few or no online components, but when asked about specific tools and technologies whose use would make their courses blended, faculty members believe that their teaching would improve by their use.

This rejection of the forest but acceptance of the trees makes it clear that there remains some misunderstanding among faculty about just what online or blended teaching and learning entails. Again, there is still much work to do to educate faculty about the strong learning outcomes of blended instruction. There is an opportunity here for providing professional development to faculty. Such training may be offered by an institution's central IT unit or a center for teaching and learning, or some partnership of these campus units. Furthermore, as nearly three-quarters of faculty use their institution's help desk services when they need technology support, there is a clear avenue for providing training to faculty in integrating technology into their courses.

At the bottom of the list are those technologies that the greatest percentage of respondents disagreed would make them more effective: social media and smartphones. As reported in the student study, 97% of students own smartphones, 83% of students used a smartphone for one or more of their courses, and half of students consider it very or extremely important to their academic success. Moreover, as reported in the "Device Ownership" section, 93% of faculty personally own a smartphone. Given that smartphones are ubiquitous and so extensively used by students for academic purposes (and have been for so long⁴⁷), there is a clear opportunity here for instructional designers to help faculty gain a better understanding of how to use these devices for teaching and learning.

The question about integrating technology into courses was followed by a question about factors that would motivate the respondent to integrate more or better technology into their teaching practices or curriculum.⁴⁸ At the top of that list, selected by more than one-third of respondents, were "Clear indication/evidence that students would benefit" and "Release time to design/redesign my courses."

Clear evidence of the efficacy (or lack thereof) of some of these technologies for learning is only starting to emerge—for example, research on student early-alert systems.⁴⁹ And the evidence that does exist for some of these technologies is highly context-dependent, as with research on educational games.⁵⁰ That said, as discussed above, there is a great deal of evidence about the efficacy of many educational technologies.⁵¹

Provosts and other members of the institutional administration need to be aware that faculty want release time for redesigning their courses to integrate technology. Student success is of course central to the mission of all institutions of higher education. Given that blended instruction has stronger learning outcomes than face-to-face instruction alone,⁵² institutions should be doing everything they can to motivate faculty to integrate more and better technology into their teaching. Release time is expensive for an institution, but it would behoove institutions to set some funds aside for this purpose.

Another way in which institutions can motivate faculty to integrate technology into their teaching is by providing more support for doing the work of this integration. Nearly one-quarter of respondents indicated that “Direct assistance from IT staff to support the technology I choose to implement” and “Direct assistance from an instructional design expert” would be motivating for them. This is a clear opportunity for both IT units and centers for teaching and learning—independently or collaboratively—to provide a high-touch consulting-like service to faculty.

Policies on Mobile Devices

As discussed in the “Integration of Technology into Teaching” section, approximately half of faculty agreed or strongly agreed that they could be more effective if they were better skilled at integrating students’ laptops, tablets, and smartphones into their courses. (We did not ask about wearables in that section of the survey.) Yet a significant percentage of faculty either discourage or outright ban these devices from their classroom.

Note that faculty members’ self-reports about their classroom policies do not match students’ reports of their instructors’ classroom policies. As figure 13 shows, half of faculty say that their policy is to encourage or require laptops, but only a third of students report that this is the case.⁵³ Half of faculty said that they discourage or ban smartphones from the classroom, but two-thirds of students said that their instructors do so. It is not quite clear what explains this discrepancy: Are students misunderstanding their instructors’ policies? Do students more readily recall the more restrictive policies? Are faculty members’ responses to this question suffering from social desirability bias?

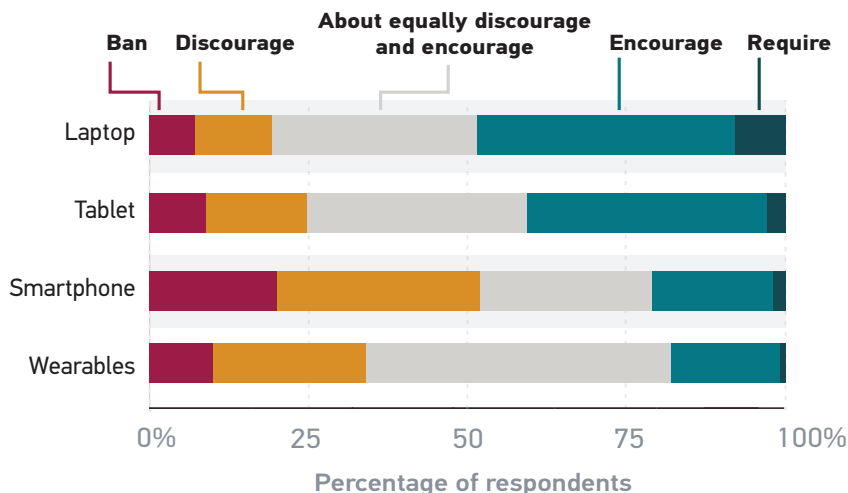


Figure 13. Classroom policies on mobile devices

In any event, it should come as no surprise that faculty beliefs about the usefulness of a device as educational technology are associated with classroom policies about that device. Across the board, faculty members who believe that they could be more effective instructors if they were better skilled at integrating a device into their courses are more likely to have policies encouraging or requiring its use in the classroom. The converse is also true—faculty who disagree that they could be more effective if they were better skilled at integrating a device into their courses are more likely to have policies discouraging or banning its use in the classroom.

Similarly, faculty policies regarding devices are associated with the type of learning environment they prefer to teach in. Obviously, in courses that are completely online, students must use a device. Even in blended courses, however, the greater the degree of blendedness (some online components, about half and half, or mostly online), the more likely the faculty member is to encourage or require students to use all of the devices in figure 13.

Furthermore, faculty policies regarding laptops and tablets are associated with the faculty member’s age, though not in the direction one might expect: *Older* faculty members are *more* likely to encourage or require students to use a laptop or a tablet in the classroom.

This finding, however, may not be strictly about faculty members’ age. While greater age does not necessarily mean a larger number of years as a faculty member, faculty members’ policies regarding devices are also associated with the number of years in a faculty position. A recent study of faculty members found that one of the strongest disincentives to innovation in the classroom is

a fear of embarrassing themselves in front of students.⁵⁴ Fundamentally, this is a matter of a faculty member's level of skill in classroom management: The longer faculty have been teaching, generally the greater their skill in classroom management, and the greater their skill in classroom management, the less fear they would have of embarrassing themselves in front of students. In short, faculty who are more confident in their classroom management skills are more likely to encourage or require students to use devices in the classroom.

Faculty attitudes about educational technology are also associated with their policies about devices in the classroom. As all students know, some faculty are more willing to experiment with technology than others. The fact that classroom policies are not significantly associated with the type of institution (Carnegie class, institutional size, enrollment, or complexity index⁵⁵), however, seems to indicate that these policies are largely idiosyncratic to faculty members and have little to do with the institution, its policies, or level of support for technology. This finding is supported by the association of classroom policies with faculty members' age. Research outside academia has found that age is associated with innovative behavior in organizational settings,⁵⁶ so to the extent that encouraging the use of devices in the classroom can be considered innovative, it is to be expected that senior faculty members would do so at a greater rate than junior faculty. Research within academia has found that "reward systems for faculty members, particularly untenured ones, are not aligned with institutional aspirations" toward innovation,⁵⁷ thus reinforcing the association of age and innovative behavior among faculty.⁵⁸

Conclusion

This report is the third study of faculty and information technology to be conducted by ECAR. While many of the tools and technologies used by faculty have changed, many have remained consistent, and even the ways in which faculty are using these tools and technologies have remained remarkably consistent. What's more, faculty attitudes *about* these tools and technologies have remained consistent. While perhaps unsurprising, this becomes a problem when juxtaposed with the finding from the student study that students want their instructors to use more technology. This desire by students for more technology in their courses is in line with the evidence that blended instruction has stronger learning outcomes than either fully online or fully face-to-face instruction. Perhaps the most important finding to come out of this year's faculty study is that faculty remain either unaware of or unconvinced by these research findings. This puts the burden on institutions that offer online courses or programs—or that desire to increase their online offerings—to present this evidence to faculty in an effort to try to convince them to engage in more effective teaching practices. Campus IT organizations, centers for teaching and learning, and other campus units that support the faculty in a variety of ways have the infrastructure and resources to help in these efforts. Where faculty require more and better training and professional development opportunities, IT units in particular can provide programs, workshops, and information sessions. This report serves as an important first step toward bridging that gap by providing IT organizations with information about faculty experiences with technology in higher education.

Recommendations

- **Information security training should be customized to the audience.** Most faculty find their institution's information security training to be useful. But criticisms of this training are that it is too simplistic or too technical and that it is outdated. Live training sessions, offered in person, would be well received. And to be seen as relevant by faculty, sessions must include specific information and recommendations for the institution, for the discipline, and for the types of data collected by and activities being performed by the faculty audience members.
- **Institutions that offer online courses or programs should make an effort to present to faculty the research about the efficacy of fully online and blended learning for achieving student learning outcomes.** Many faculty are either unaware of or unconvinced by the research findings that fully online courses produce learning gains that are indistinguishable from those produced in fully face-to-face environments and that blended instruction has stronger learning outcomes than either mode alone. It should be a critical function of centers for teaching and learning at institutions with online courses or programs to present this evidence to faculty as part of any training in instructional design or use of tools for online teaching.
- **Institutions that offer online courses or programs should provide incentives to faculty to redesign classroom-based courses for the online environment.** Stipends and especially course release time are effective motivators for faculty.
- **Researchers studying online teaching and learning should prioritize collecting data about the efficacy of tools, technologies, and practices for which the evidence base is not yet robust.** In particular, data on the services provided by student success management systems such as course suggestions and early-alert systems would be valuable.
- **Institutions and academic units should provide—and actively promote—training for students in the use of technologies that students will use in their courses.** Students will inevitably use many tools and technologies, both commercially available (such as the Microsoft Office and Google Drive suites) and institutionally specific (such as the LMS). Many students feel unprepared to use institutionally specific technology, and some even feel unprepared to use commercial software. Regardless of the number or size of online courses or programs at an institution, technology is critical to student success, so this lack of knowledge and confidence is a major point of failure for students. This is comparatively easily remedied, however:

Institutions should identify the most critical training needs among the student body and then provide and actively promote training opportunities in these areas. Faculty are critical to improving student technology literacy by encouraging or even requiring students to attend the trainings.

- **Institutions that offer online courses or programs should develop reward systems that encourage innovation in teaching.** At research institutions particularly, though not exclusively, innovation in teaching is not well rewarded in tenure and promotion processes. Faculty who have more confidence in their classroom management skills are more likely to encourage or require students to use computing devices in the classroom. This confidence comes naturally with age and with a greater number of years in a faculty position. This confidence should also come from knowledge that the institution's policies regarding evaluation of teaching support the faculty member in experimentation and innovation with technology in the classroom and online.

Methodology

The ECAR faculty technology study is conducted in the same manner as the annual ECAR student technology study. Both rely on respondents recruited from institutions that volunteer to partner with ECAR to conduct technology research in the academic community. ECAR works with an institutional stakeholder (the survey administrator) to secure local approval to participate in the research. Once the institutional review board process is successfully navigated and a sampling plan is submitted, ECAR provides each survey administrator with the survey link for the current year's research project. The survey administrator then uses the survey link to invite participants from that institution to respond to the survey. Data were collected between January 30 and April 28, 2017, and 13,451 faculty from 157 institutional sites responded to the survey (see demographic breakdown of institutions in table M1 and respondents in table M2). ECAR issued \$100 or \$200 Amazon.com gift cards to 19 randomly selected faculty respondents who opted into a drawing offered as an incentive to participate in the survey. Colleges and universities use data from the 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	38	8,751	2,449	28%	18%	22%
BA public	19	2,526	324	13%	2%	3%
BA private	6	1,305	271	21%	2%	2%
MA public	23	10,109	1,562	15%	12%	14%
MA private	12	4,732	702	15%	5%	6%
DR public	25	43,568	4,758	11%	35%	43%
DR private	3	781	233	30%	2%	2%
Specialized U.S.	5	3,306	842	25%	6%	8%
Total U.S.	131	75,078	11,141	15%	83%	100%
Outside U.S.	26	24,866	2,310	9%	17%	–
Grand total	157	99,944	13,451	13%	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 11,141 survey responses from 131 U.S. institutions. Responses were neither sampled nor weighted. Comparisons by faculty 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 ($p < 0.001$) unless otherwise noted. Findings from the 2016 EDUCAUSE Core Data Service and the 2017 ECAR student technology study are included, where appropriate, to contextualize the findings.

Table M2. Demographic breakdown of survey respondents

	U.S. Institutions	Non-U.S. Institutions	All Institutions
Basic Demographics			
18–34 years old	10%	24%	13%
35–49 years old	38%	40%	38%
50–65 years old	41%	33%	40%
65 years or older	11%	3%	9%
Male	46%	57%	48%
Female	54%	43%	52%
White	84%	–	–
Black/African American	3%	–	–
Hispanic/Latino	4%	–	–
Asian/Pacific Islander	5%	–	–
Other or multiple races/ethnicities	5%	–	–
Faculty Profile			
Percentage of respondents who work with undergraduate students	89%	75%	87%
Percentage indicating experience with technology for teaching and learning	97%	80%	94%
Percentage indicating experience with technology for research	43%	63%	46%
Five+ years of full-time teaching experience	62%	64%	62%
Five+ years of any teaching experience	78%	72%	77%
Median years in a full-time faculty position	8	8	8
Mean years in a full-time faculty position	11	10	11
Full-time faculty member	76%	90%	78%
Part-time faculty member	24%	9%	21%
Full-Time Faculty Status			
Tenured	53%	42%	51%
Full professor	26%	14%	23%
Associate professor	19%	9%	17%
Assistant professor	20%	8%	18%
Instructor	20%	11%	18%
Lecturer/senior lecturer	7%	25%	11%
Adjunct	1%	3%	1%
Clinical professor	1%	0%	1%
Research professor	1%	1%	1%
Research associate	1%	8%	2%
Other or no academic rank	4%	21%	8%

	U.S. Institutions	Non-U.S. Institutions	All Institutions
Teaching/Research Areas			
Agriculture and natural resources	4%	4%	4%
Biological/life sciences	8%	10%	9%
Business, management, marketing	9%	13%	10%
Communications/journalism	5%	4%	5%
Computer and information sciences	6%	15%	7%
Education, including physical education	11%	8%	10%
Engineering and architecture	6%	16%	7%
Fine and performing arts	6%	3%	5%
Health sciences, including professional programs	14%	11%	14%
Humanities	13%	11%	13%
Liberal arts/general studies	11%	2%	10%
Manufacturing, construction, repair, or transportation	2%	3%	2%
Physical sciences, including mathematical sciences	11%	16%	11%
Public administration, legal, social, and protective services	2%	1%	2%
Social sciences	14%	12%	14%
Other	9%	9%	9%

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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- Patsy D. Moskal, Associate Director, Research Initiative for Teaching Effectiveness, University of Central Florida;
- 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.

Finally, we want to acknowledge our EDUCAUSE colleagues for their contributions to these reports. Perhaps the biggest thank you goes to Jamie Reeves, whose commitment to this annual project is unsurpassed and whose organizational skills are par excellence. Considerable thanks go to Mike Roedema, whose deep historical knowledge of these survey projects repeatedly proves invaluable and whose keen eye for statistical interpretations keeps us researchers honest in our analyses. Thanks also are due to Susan Grajek and Mark McCormack for their careful reviews, insight, and guidance in finalizing this project. We also want to thank Kate Roesch for artistic vision and creating figures that neither of us could conceive or execute; Gregory Dobbin and the publications team for their attention to detail, command of the written word, and ability to nudge us into making the right editorial decisions; and Lisa Gesner for her extraordinary ability to connect all of the dots all of the time.

Appendix: Participating Institutions

Aalto University
Abilene Christian University
Adams State University
Alexandria Technical & Community College
Anoka Technical College
Anoka-Ramsey Community College
Appalachian State University
Arcada University of Applied Sciences
Arcadia University
Auburn University
Bemidji State University
Broward College
Butler University
California State University, Channel Islands
Case Western Reserve University
Central Lakes College
Centria University of Applied Sciences
Century College
Chadron State College
Chatham University
Clemson University
Collin County Community College District
Dakota County Technical College
Davidson College
Eastern Mennonite University
Eastern Michigan University
Fond du Lac Tribal and Community College
Forman Christian College University
Furman University
Gallaudet University
Georgia College & State University
Grand Canyon University
Haaga-Helia University of Applied Sciences
Heidelberg University
Helsinki Metropolia University of Applied Sciences
Hennepin Technical College
Hibbing Community College
Idaho State University
International Medical University (Malaysia)
Inver Hills Community College
Itasca Community College
Joliet Junior College
Juniata College
Kajaani University of Applied Sciences
Kenai Peninsula College
Koc University
Kodiak College
Lake Superior College
Lappeenranta University of Technology
Laurea University of Applied Sciences
LeTourneau University
Lipscomb University
Louisiana State University
Loyola Marymount University
Marist College
Marshall University
Matanuska–Susitna College
Mesabi Range College
Metropolitan State University
Middle East Technical University
Minneapolis Community and Technical College
Minnesota State College Southeast
Minnesota State Community and Technical College
Minnesota State University, Mankato
Minnesota State University Moorhead
Minnesota West Community and Technical College
Montana State University
Montgomery County Community College
Muskingum University
Normandale Community College
North Hennepin Community College
Northern State University
Northland Community and Technical College
Northwest Technical College
Northwestern Michigan College
Nova Scotia Community College
Oregon State University
Pellissippi State Community College

Penn State Abington	St. Norbert College
Penn State Altoona	St. Petersburg College
Penn State Beaver	Tampere University of Applied Sciences
Penn State Behrend	Tampere University of Technology
Penn State Berks	Tarleton State University
Penn State Brandywine	The College of Saint Rose
Penn State DuBois	The Hong Kong Polytechnic University
Penn State Fayette	The Penn State Dickinson School of Law
Penn State Great Valley School of Graduate Professional Studies	The University of Memphis
Penn State Greater Allegheny	Thomas College
Penn State Harrisburg	Truman State University
Penn State Hazleton	University of Alaska Anchorage
Penn State Lehigh Valley	University of Arkansas
Penn State Milton S. Hershey Medical Center College of Medicine	University of British Columbia
Penn State Mont Alto	University of British Columbia, Okanagan
Penn State New Kensington	University of Central Florida
Penn State Schuylkill	University of Delaware
Penn State Shenango	University of Eastern Finland
Penn State University Park	University of Florida
Penn State Wilkes-Barre	University of Helsinki
Penn State World Campus	University of Jyvaskyla
Penn State Worthington Scranton	University of Lapland
Penn State York	University of Maryland
Pine Technical and Community College	University of Maryland, Baltimore County
Portland State University	University of Michigan–Ann Arbor
Prince William Sound College	University of Montana
Ridgewater College	University of Nevada, Las Vegas
Riverland Community College	University of Nevada, Reno
Rochester Community and Technical College	University of North Texas
Rose-Hulman Institute of Technology	University of Tampere
Saint Cloud Technical and Community College	University of Texas Rio Grande Valley
Saint Michael's College	University of the Arts Helsinki
Saint Paul College	University of Vaasa
Seattle Pacific University	University of Washington
Sonoma State University	Vaasa University of Applied Sciences
South Central College	Vermilion Community College
South Dakota State University	Wayne State College
Southwest Minnesota State University	West Virginia University
St. Cloud State University	William Paterson University of New Jersey
	Winona State University

Notes

1. Responses to these questions were on a 5-point Likert-type scale, ranging from “poor” to “excellent.”
2. Responses to this survey question do not sum to 100%, as respondents could select up to three items.
3. This behavior is consistent with “cognitive miser theory,” according to which, in order to reduce the cognitive load of day-to-day decision making, individuals take mental shortcuts. Relying on sources of perceived expertise is one such shortcut that faculty would be likely to make. See Susan T. Fiske and Shelley E. Taylor, *Social Cognition* (2nd ed.) (New York: McGraw-Hill, 1991).
4. T. D. Wilson, “On User Studies and Information Needs,” *Journal of Documentation* 37, no. 1 (1981): 3–15; C. Kuhlthau, *Seeking Meaning: A Process Approach to Library and Information Services* (London: Libraries Unlimited, 2004).
5. K. E. Fisher, S. Erdelez, and L. McKechnie, eds., *Theories of Information Behavior* (Medford, N.J.: Information Today, Inc., 2005).
6. 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.
7. D. Christopher Brooks and Jeffrey Pomerantz, *ECAR Study of Undergraduate Students and Information Technology, 2017*, research report (Louisville, CO: ECAR, October 2017).
8. Karen A. Wetzel and Jeffrey Pomerantz, *Organizational Models for IT Service Delivery and the Evolving IT Organization*, research report (Louisville, CO: ECAR, August 2016).
9. The institution at which one of our external reviewers for this report series works implemented a creative and effective “train the trainers” program. During the institution’s recent migration from one LMS platform to another, the IT unit designated a faculty member in each academic unit as the first line of support and provided extra training and—importantly—stipends for these faculty. These faculty members invited their colleagues to join them in a classroom prior to the start of the semester and helped everyone set up their courses for the first time in the new LMS platform.
10. Responses to this question were on a 5-point Likert-type scale, ranging from “strongly disagree” to “strongly agree.”
11. 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).
12. Responses to this question were on a 5-point Likert-type scale, ranging from “not at all useful” to “extremely useful.”
13. Even what passes for “common sense” in creating secure passwords is actually poor information security practice. Robert McMillan, “The Man Who Wrote Those Password Rules Has a New Tip: N3v\$r M1^d!,” *Wall Street Journal*, August 7, 2017; Nick Statt, “Best Practices for Passwords Updated after Original Author Regrets His Advice,” *The Verge*, August 7, 2017.
14. Rachael Gabriel, “The Case for Differentiated Professional Support: Toward a Phase Theory of Professional Development,” *Journal of Curriculum and Instruction* 4, no. 1 (2010).
15. Responses to this survey question do not sum to 100%, as respondents were asked to select all that apply.

16. Brooks, *ECAR Study of Faculty and Information Technology, 2015*.
17. In the 2015 faculty study, 48% of respondents' institutions provided laptops.
18. Since 2011, the Pew Research Center and the U.S. Census have both combined laptop and desktop ownership into a single category of device ownership. See [Mobile Fact Sheet](#) from the Pew Research Center.
19. Brooks and Pomerantz, *ECAR Study of Undergraduate Students and Information Technology, 2017*. Some institutions are experimenting with innovative models of providing technology support to students. The University of Mary Washington's Digital Knowledge Center, for example, provides a peer tutoring service to students—staffed by students.
20. See [Integrated Planning and Advising for Student Success \(iPASS\)](#).
21. Carl Straumsheim, "[A New* System for Student Success Planning](#)," *InsideHigherEd*, July 5, 2017.
22. Jon Becker, "[Nurturing Curiosity through Course Selection/Registration](#)," April 8, 2016; Gardner Campbell, "[cri de cœur](#)," April 10, 2016.
23. Leah Lang and Judith A. Pirani, *The 2015 Enterprise Application Market in Higher Education: Learning Management Systems*, research report (Louisville, CO: ECAR, December 19, 2016).
24. Phil Hill, "[State of Higher Ed LMS Market for US and Canada: Spring 2017 Edition](#)," *e-Literate*, May 15, 2017.
25. At many institutions, the LMS gradebook syncs with the registrar's database (e.g., PeopleSoft).
26. Lang and Pirani, *The 2015 Enterprise Application Market in Higher Education: Learning Management Systems*.
27. Michael Feldstein, "[The First e-Literate Subscription Product](#)," *e-Literate*, April 16, 2016.
28. Lang and Pirani, *The 2015 Enterprise Application Market in Higher Education: Learning Management Systems*.
29. Eden Dahlstrom and D. Christopher Brooks, with a foreword by Diana Oblinger, *ECAR Study of Faculty and Information Technology, 2014*, research report (Louisville, CO: ECAR, July 2014).
30. Brooks, *ECAR Study of Faculty and Information Technology, 2015*.
31. "System availability" and "system response time" were items no. 2 and no. 6, respectively, in 2015 but were not asked about on the 2017 survey, as they are not features of the LMS per se.
32. Jeff Seaman and I. Elaine Allen, "[Opening the Textbook: Educational Resources in U.S. Higher Education, 2015–16](#)," Babson Survey Research Group, July 2016.
33. Jim Groom and Brian Lamb, "[Reclaiming Innovation](#)," *EDUCAUSE Review* 49, no. 3 (May/June 2014).
34. John Whitmer, "[Patterns in Course Design: How Instructors ACTUALLY Use the LMS](#)," Blackboard Blog, October 27, 2016.
35. Malcolm Brown, "[The NGDLE: We Are the Architects](#)," *EDUCAUSE Review*, July 3, 2017.
36. "[7 Things You Should Know about NGDLE](#)," ELI, December 2015.
37. See the [July/August 2017 edition of EDUCAUSE Review](#) for more on this topic.
38. Brown, "The NGDLE: We Are the Architects."
39. Barbara Means, Marianne Bakia, and Robert Murphy, *Learning Online: What Research Tells Us about Whether, When and How* (New York: Routledge, 2014); 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).

40. Goldie Blumenstyk, “Which Ed-Tech Tools Truly Work? New Project Aims to Tell Why No One Seems Eager to Find Out,” *Chronicle of Higher Education*, July 21, 2016.
41. Means, Bakia, and Murphy, *Learning Online*; Means et al., *Evaluation of Evidence-Based Practices*.
42. This finding is consistent with the results of an APLU study of faculty opinions about online learning: “Faculty with experience developing or teaching online courses have a much more positive view towards on-line instruction than those without such experience. Faculty with no online experience remain relatively negative about online learning outcomes.” Jeff Seaman, *Online Learning as a Strategic Asset*, Association of Public and Land-grant Universities, 2009.
43. Brooks and Pomerantz, *ECAR Study of Undergraduate Students and Information Technology, 2017*.
44. Responses to this question were on a 5-point Likert-type scale, ranging from “strongly disagree” to “strongly agree.”
45. Leonard J. Waks, *The Evolution and Evaluation of Massive Open Online Courses: MOOCs in Motion* (New York: Palgrave Pivot, 2016).
46. Jan-Martin Lowendahl, “Hype Cycle for Education, 2016,” Gartner, July 1, 2016. MOOC platforms mysteriously vanished entirely from Gartner’s 2017 Hype Cycle for Education: Kelly J. Calhoun Williams, “Hype Cycle for Education, 2017,” Gartner, July 24, 2017.
47. Yvonne Belanger, *Duke University iPod First Year Experience Final Evaluation Report*, June 2005.
48. Respondents were asked to select up to three factors.
49. Eden Dahlstrom and Jacqueline Bichsel, *ECAR Study of Undergraduate Students and Information Technology, 2014*, research report (Louisville, CO: ECAR, October 2014).
50. Luis de-Marcos, Eva Garcia-Lopez, and Antonio Garcia-Cabot, “On the Effectiveness of Game-Like and Social Approaches in Learning: Comparing Educational Gaming, Gamification & Social Networking,” *Computers & Education* 95 (April 2016): 99–113; Anja Hawlitschek and Sven Joeckel, “Increasing the Effectiveness of Digital Educational Games: The Effects of a Learning Instruction on Students’ Learning, Motivation and Cognitive Load,” *Computers in Human Behavior* 72 (2017): 79–86.
51. Means, Bakia, and Murphy, *Learning Online*; Blumenstyk, “Which Ed-Tech Tools Truly Work?”
52. Means et al., *Evaluation of Evidence-Based Practices*.
53. See the “Uses, Abuses, and Consequences of Classroom Device Use” section of the student study.
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55. Johan Bergström, Eden Dahlstrom, Pekka Kähkipuro, Anne Kealley, Leah Lang, Lori MacMullen, Michele Mennielli, Paul Sherlock, and Peter Tinson, *Benchmarking IT: A Global Approach* (Louisville, CO: ECAR, July 15, 2015).
56. Thomas W. H. Ng and Daniel C. Feldman, “A Meta-Analysis of the Relationships of Age and Tenure with Innovation-Related Behaviour,” *Journal of Occupational and Organizational Psychology* 86, no. 4 (2013): 585–616.
57. Paul R. Sanberga, Morteza Gharib, Patrick T. Harker, Eric W. Kaler, Richard B. Marchase, Timothy D. Sands, Nasser Arshadi, and Sudeep Sarkar, “Changing the Academic Culture: Valuing Patents and Commercialization toward Tenure and Career Advancement,” *PNAS* 111, no. 18 (2014): 6542–6547.
58. The average age for earning tenure in the U.S. is 39. See *USA, Academic Career Structure*.