EDUCAUSE CENTER FOR ANALYSIS AND RESEARCH

ECAR Study of Faculty and Information Technology, 2015

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Contents

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Foreword

This second year of the faculty technology study is situated in the middle of what is surely one of the most dynamic decades in the history of higher education. Colleges and universities are monitoring or actively participating in some remarkable tectonic changes, including new technologies, new models for teaching and learning, and even new institutional models. With the 2015 annual EDUCAUSE Top 10 IT Issues list, we said that we are at an inflection point and that deploying technologies in appropriate ways can make significant differences for our students and for us. This year's faculty technology study shows these activities well under way.

While the broad national conversation about transformation is crucial, the traction for much of the change that technology promises clearly happens (or doesn't happen) at that point where faculty connect with students. If we want to present a complete picture of the challenges we are trying to solve and the promise of technology, the voices of our faculty and our students must be included.

This is why the EDUCAUSE faculty technology study is so important—and why the findings should be discussed not only by technology leaders but by all those involved in teaching and learning on campus. For a long time, we have identified technology as game changing, but if we're going to embrace the game metaphor we also need to recognize that teamwork across campus is essential.

While the study suggests that faculty are, on the whole, pleased with campus IT, it also points to opportunities for deeper shared understanding. Interestingly, faculty in this study believe that IT may not have the funding or capacity to manage change as well as it could, suggesting potential for powerful, combined advocacy for appropriate technology investment. The greatest value of a study like this is not the conclusions it reaches but the campus conversations it begins. I urge college and university leaders to use this study to engage departments and divisions in considering the topics raised here. Reviewing these results together will make it possible for IT professionals to better understand faculty perspectives about existing and emerging technologies.

John O'Brien, EDUCAUSE

Executive Summary

In this second year of our research on faculty and information technology (IT), the EDUCAUSE Center for Analysis and Research (ECAR) partnered with 139 colleges and universities, obtaining responses from 13,276 faculty members. This year's report is confirmatory in that it builds on the findings from the 2014 ECAR study on the same topic. The report is also exploratory in that it strives to better understand new areas of faculty's technology experiences and expectations. When combined with other EDUCAUSE reports, services, and publications such as the annual ECAR student technology study, the ELI Content Anchor Survey, the EDUCAUSE Top 10 IT Issues list, and the EDUCAUSE Core Data Service (CDS), the faculty study provides a fairly comprehensive perspective on IT in higher education. When appropriate, we attempt to make explicit connections among these resources to provide the reader with a more robust understanding of the context and meaning of our findings.

The 2015 report on faculty and IT is organized with the faculty member in mind, moving from topics that are the most immediate to the faculty experience to issues that are more remote. We begin by trying to understand who our faculty respondents are in terms of their demographic characteristics and how faculty relate to technology as individuals. Faculty own a lot of technology and in general have a very positive orientation toward technology.

In the second section, we explore what faculty think about technology as it relates to teaching, learning, and students, and we look at a host of reasons why many faculty are reluctant to incorporate technology into their pedagogy or curricula. Again we found that in general faculty are positive and hopeful about the impact of technology on teaching and learning practices and on student learning outcomes. When it comes to research—one of faculty's other key duties—we found that institutional resources are often adequate for faculty to carry out their projects, while there is nevertheless room for improvement in terms of the services provided by IT organizations, especially for data-intensive research.

Faculty also expressed considerable satisfaction with campus technologies, especially learning management systems (LMSs) and classroom technologies. At the same time, faculty expressed reservations about mining student data—especially nonacademic data—for information that could promote student success. Finally, faculty rated IT organizations' support services and privacy and security policies relatively high. However, faculty do not seem to have strong opinions about the other functions and activities performed by those units, in part because IT organizations are so far removed from the daily experience of faculty.

Overall, the results of the 2015 study are consistent with the results of our previous study. Faculty like technology and want to use it in creative and innovative ways to enhance teaching practices and improve student learning outcomes. To do this, however, faculty need clear evidence of the impact of technologies and the practices associated with them. They want more training, support, and development to help them better understand how to use the technologies effectively, and they want resources that can give them the wherewithal to change their pedagogical approaches and curricula. These findings and the data that support them should be taken seriously by IT leaders and staff who are uniquely positioned to respond to faculty demands by providing evidence, training and development opportunities, and technological infrastructure to support the educational mission of their institution. IT organizations that can meet faculty where they are and help them get to where they need to be, technologically speaking, will be well situated to encourage the thoughtful and effective application of technology to higher education and to institutional priorities such as student success and learning.

Key Findings

- **Faculty own a variety of technologies, possess generally positive dispositions and attitudes toward technology, and use it extensively.** About three-fourths of faculty own three or more types of technology typically used in higher education settings (e.g., laptops, tablets, smartphones). Regarding technologies that have potential educational value, about one-third of faculty members own or plan to purchase a gaming device, and a similar proportion own or plan to purchase wearable technologies.
- **Faculty have considerable experience teaching with technology, especially using digital learning environments.** Faculty are embracing blended learning approaches, with a majority of faculty using them in at least a few of their courses. The flipped classroom model, in which the lecture and homework elements of a course are reversed, appears to be gaining in popularity, with about one-third of faculty reporting that they have used it in at least a few of their courses.
- **Faculty claim that they would adopt technology more if they had evidence of its impact on student learning.** Faculty across all institution types said that they would integrate more or better technology into their teaching practices and curricula if they had a clear indication or evidence that students would benefit.
- **Faculty are motivated by the prospect of having release time to design or redesign their courses to better incorporate technology.** The relative importance of time—compared with more tangible forms of compensation such as monetary or other value-oriented incentives—suggests that time is a faculty member's most valuable resource.
- **A majority of faculty think that mobile technology can enhance student learning**. Given that faculty have strong positive dispositions and attitudes toward technology and claim to be motivated to develop a better understanding of how to use mobile technologies in the classroom, they are poised to have their opinions about mobile technologies changed and to begin marshaling those technologies to improve student learning outcomes.
- **Faculty policies on the use of mobile devices in the classroom depend on a host of factors.** A faculty member who thinks that students use the devices for class-related activities or that such technologies can enhance the student learning experience is more likely to encourage or require the use of those devices. However, if faculty find that the use of mobile technologies in the classroom is distracting either to students or themselves, then the probability of the devices' being banned or discouraged increases significantly.
- **Faculty think that IT organizations are currently performing well but are not necessarily strategically positioned to support future institutional and faculty needs.** Faculty tend to think that their particular institution maintains a highly qualified staff, is committed to supporting accessible or adaptive technologies for students with disabilities, and supports faculty use of technology. However, they do not think that their institution increases the IT organization's capacity for managing change or funds IT strategically; nor do they think that IT is agile with regard to responding to changing conditions and new opportunities.
- **Faculty see room for improvement among IT professionals in terms of their support for data-intensive research projects.** Faculty tend to think that IT does not play an integral part in providing research computing services. They see IT as more reactive than proactive in responding to research computing needs.

Introduction

The EDUCAUSE Center for Analysis and Research (ECAR) has conducted research on undergraduate students and IT since 2004 and in 2014 expanded this research to include the perspectives and experiences of faculty. Understanding how faculty relate to and use educational technologies and what they think about the IT services is essential to meeting instructional technology and research computing demands. In this second year of the faculty study, 13,276 respondents from 139 institutions in 10 countries (including the United States) and 39 U.S. states participated in the research (see figure 1). The overall response rate was 12% of the population surveyed, a rate that is comparable to that of similar online surveys. The quantitative findings in this report were developed using the 12,070 survey responses from faculty at U.S. institutions. The large number of survey respondents yielded a 1% margin of error and allows us to make generalized statements about the findings. 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; and instructors).

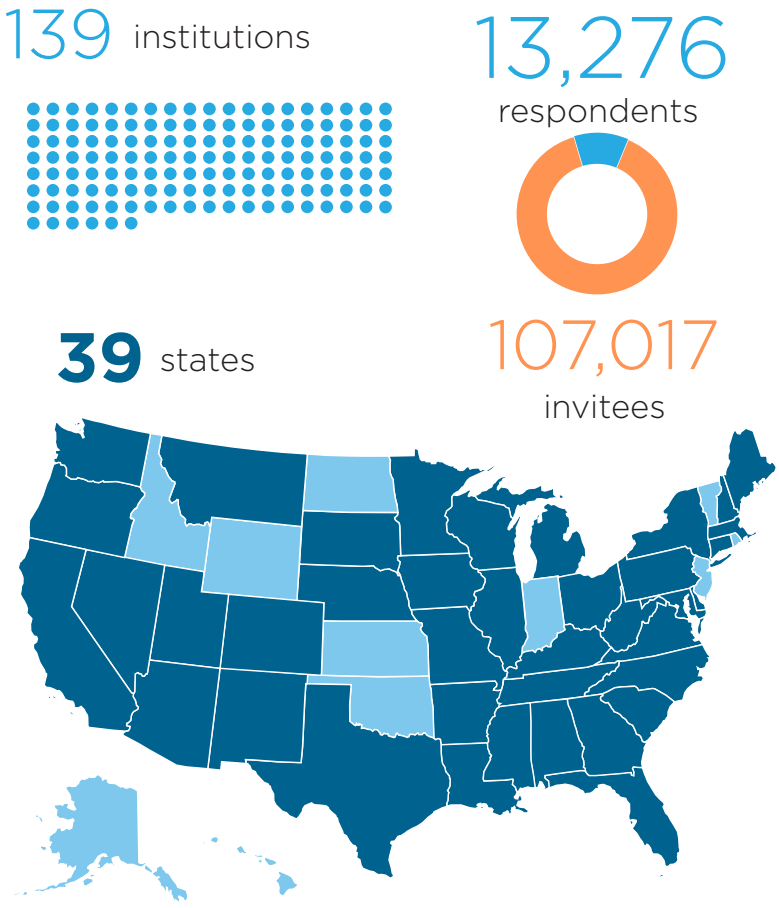

Figure 1. Faculty study participation overview

The findings in this report were developed using the full data set of respondents from the United States and are broken out by institution type, region, and faculty type, as appropriate to communicate meaningful results. Preliminary data from the 2015 student study, historic data from the 2014 faculty study and previous student studies, institutional data from the EDUCAUSE Core Data Service (CDS), and data from scholarly and journalistic literature are included to contextualize the results and present a broader story of technology experiences in the academic community.

This research project was designed to gather information directly from faculty via an online survey about their experiences with technology. We asked them about their years of experience, rank, and other professional demographics; general technology adoption and use experiences; experiences with technology specific to teaching and learning; experiences with and perspectives about technology in a variety of learning environments; technology experiences in pursuit of research and scholarship; expectations and experiences at their respective colleges and universities; and general perspectives about their personal technology dispositions, attitudes, and usage patterns.

Faculty perspectives on technology experiences and expectations provide IT and institutional leadership with a wealth of information that can be employed to develop strategies that will help institutions:

- Improve IT services
- Increase technology-enabled productivity
- Prioritize strategic contributions of IT to higher education
- Plan for technology shifts among the various constituencies of the academic community
- Become more technologically competitive in relation to peer institutions or ideal benchmarks
- Clarify how IT professionals can help faculty integrate more and/or better technology into their teaching practices, curricula, and research

Moreover, when combined with the voices of undergraduate students, this research is important for gaining a better understanding of faculty perspectives on technology in relation to teaching and research.

These research objectives were met by asking faculty about their technology experiences, having them rate their technology satisfaction and rank its importance, and having them share with us their technology needs and expectations. Though we can make generalized statements about the findings based on the large number of survey respondents, applying these findings is an institutionally specific undertaking. Unique institutional cultures and priorities affect the answers to questions such as why this information is important to "me" and what "my faculty and/or students" say about this. These empirical findings supplement what IT professionals already know about faculty technology experiences and can help improve the academic community's experiences with technology.

Any higher education institution interested in contributing data to future iterations of this project may contact us at study@educause.edu. Participating institutions will receive the added bonus of seeing how their faculty's responses compare with those of peer institutions in a separate peer benchmarking report. These peer benchmarking reports provide a framework for contextualizing the findings for your faculty.

Findings

This report is organized in such a way that the topics move from those things that faculty respondents are most familiar with to those that are most remote from their experience. We begin by considering what faculty presumably know the most about—themselves. Specifically, we examine the technologies they own, their dispositions and attitudes toward IT, and how they use IT. This gives us a baseline understanding of how faculty are approaching technology in higher education.

We then explore faculty opinions about technology as it relates to teaching, learning, and students. After discussing faculty experiences with technology, we explore the skills faculty require to better integrate technology into their teaching, as well as their motivations for seeking to improve those skills. We conclude this section with faculty perceptions of student device use—including in-class mobile technology use and faculty bring-your-own-device (BYOD) policies and practices—and general opinions about students and technology.

Next, we consider faculty perceptions of institutional support for general research and data-intensive research. Moving beyond the typical faculty functions of teaching and research, we then turn our attention to how faculty use, relate to, and think about a few existing and emerging campus technologies. We conclude the report with faculty evaluations of broader aspects of IT at their institutions, including the functions and activities of IT, support services and their sources, and privacy and security policies and procedures.

Shifting from Users to Learners

There is a shift afoot in the teaching and learning community with respect to the way we think about digital technology. We increasingly regard digital technology as *infrastructure* and hence a stepping-stone to the real end, enabling *digital learning environments*.

In the past, our concern had most often been to get technology into the hands of faculty and students. We wanted to get them to be users of digital technology. We structured our faculty development programs to consist of workshops aimed at making instructors efficient users of applications and digital resources. We distributed media players and tablets, sometimes on a large scale. We put technology in the foreground, which carried with it the implicit assumption that if you only put technology into the hands of students and instructors, good things will result. This was appropriate in a time when technology ownership was something of a novelty.

Today the utter ubiquity of digital technology makes it invisible. Now we are shifting our focus to learners, the design of learning experiences, and the application of learning principles. Our previous emphasis on "teaching with technology" is giving way to emphasis on designing active learning experiences using flexible classrooms, collaborative learning opportunities, and competency-based curricula. Instead of a series of workshops, we are designing our faculty development program as an ongoing curriculum tailored to the needs of adult learners. Our teaching and learning support teams are increasingly made up of instructional designers as opposed to technologists.

Our question has shifted from "what do you *own*" to "what kind of learning experiences does technology *enable*." As a recent Edugeek blog post put it, active learning, and not technology, has become the "dominant narrative" for teaching and learning today.

—Malcolm Brown, Director, EDUCAUSE Learning Initiative

Faculty Demographics and Characteristics

According to our sample, faculty own a variety of technologies, possess generally positive dispositions and attitudes toward technology, and use it extensively.

Educational Technology Ownership

A majority of faculty continue to own, or aspire to own, the mainstream devices such as laptops (93%), smartphones (89%), tablets (80%), and desktop computers (73%) (see figure 2). Although laptop and smartphone ownership have leveled off in recent years, tablet ownership has increased by an additional 33% since 2014,[1] and desktop ownership is showing signs of waning, down 12% since 2013.[2] About one-third of faculty members own or plan to purchase technologies with emerging educational applications in the near future—wearable technologies (32%) or gaming devices (32%).

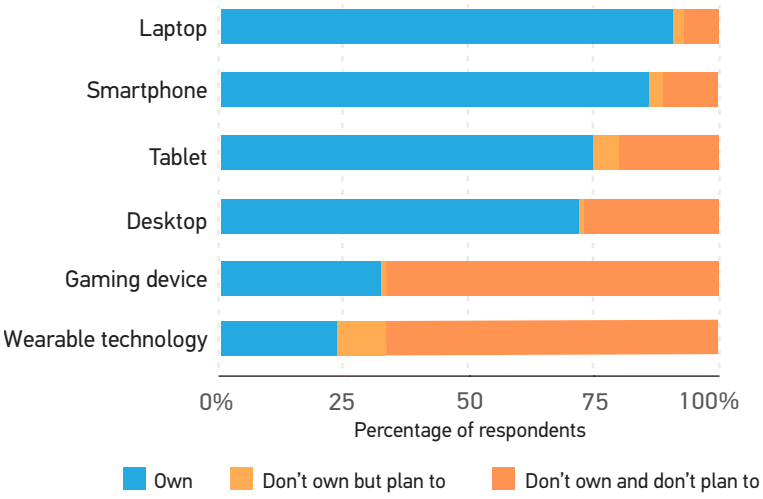

Figure 2. Faculty educational technology ownership

About three-fourths of faculty members own three or more of the six types of technology that we asked about: 17% own two different types of devices, 4% own just one type of technology, and 3% own none of the technologies noted in our survey. The overlap of faculty ownership of mobile technologies is considerable, with most respondents claiming ownership of two or more mobile technologies (see figure 3). Given the breadth and depth of faculty technology ownership—especially of mobile technologies—faculty have the means by which to leverage technology to their advantage in teaching and research.

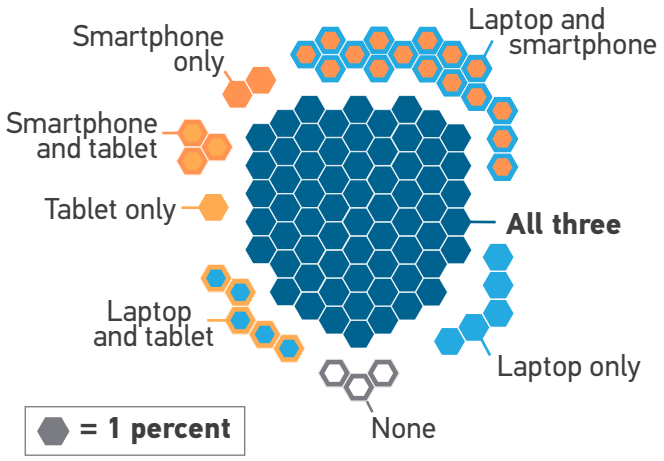

Figure 3. Faculty laptop, tablet, and smartphone ownership

Technology Disposition, Attitude, and Usage

Faculty have strongly positive dispositions and attitudes toward technology and reported using technology extensively and frequently. As in last year's survey, we asked faculty to place themselves on a series of 100-point semantic differential scales (see appendix B) related to their IT dispositions (e.g., enthusiastic versus reluctant, early versus late adopter, technophile versus technophobe); attitudes (e.g., satisfied versus dissatisfied, burdensome versus beneficial, useful versus useless, enhancement versus distraction); and usage patterns (e.g., always versus never connected, central versus peripheral, new versus old media, frequent versus infrequent use). The results once again reveal that faculty see themselves as technologically sophisticated and engaged, averaging significantly above the neutral position (50) on the scales (see figure 4). On average, faculty report disposition, attitude, and usage levels similar to what we observed in 2014. Additionally, faculty are largely homogeneous regarding their IT disposition, attitude, and usage patterns.[3]

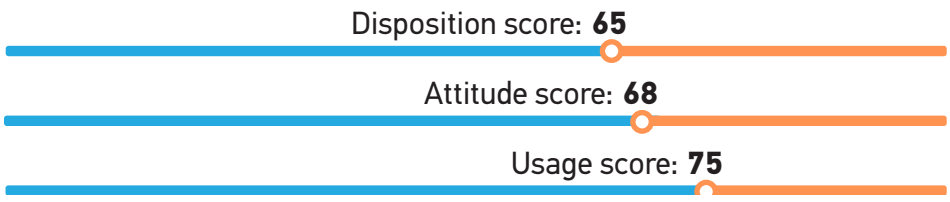

Figure 4. Mean scores of faculty semantic differential toward technology

Faculty Views on Teaching, Learning, and Students

Faculty have a lot of experience teaching with technology but would like more evidence of its efficacy and more training on how to better incorporate technology into their classrooms. At the same time, faculty formulate classroom policies on mobile devices and BYOD technologies based on their individual perceptions of student uses of those technologies.

Teaching Experience with Technology

Current higher education faculty appear to have considerable experience in teaching with technology, especially using digital learning environments (see figure 5). A majority (56%) of instructors reported having taught at least a few of their courses in the past year using a blended approach, one in which the course was taught partially online and partially face to face, granting students some control over their learning experiences. Although a full two-thirds of faculty in our sample had not taught a completely online course in the past year, one-fifth had taught from about half to all of their courses in a fully online environment. The 2015 *NMC Horizon Report* predicted that the flipped classroom model—in which lecture and homework elements of a course are reversed—is one year or less from adoption.[4] ECAR found that a third of faculty (33%) have used a flipped classroom pedagogical model. Future ECAR research in this area can confirm the predicted trends. Finally, almost all faculty (81%) know what massive open online courses (MOOCs) are. While awareness is greater this year than last year, the percentage of faculty teaching MOOCs remained about the same. Only 2% of faculty who taught an online class in the past year taught a MOOC that year.

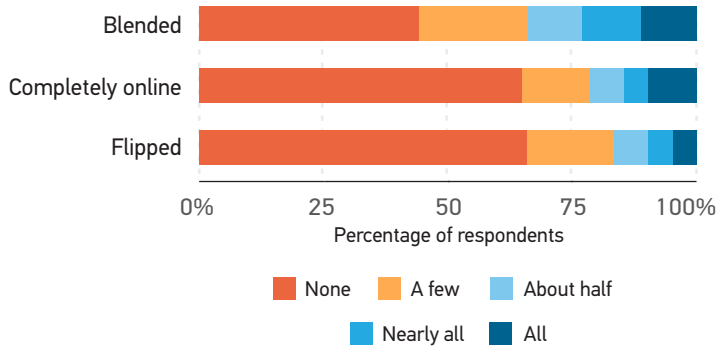

Figure 5. Faculty experience teaching in technology-enhanced environments

Faculty who teach in technology-enhanced environments also seem to have pretty clear ideas about the sorts of activities and assignments they prefer to have students do online and face to face. We asked faculty to tell us what types of assignments they prefer in online versus face-to-face environments. In the online components of their courses, faculty prefer that students complete assessments, view videos, and read materials; by contrast, in face-to-face settings instructors ask students to conduct group work and collaborate, deliver presentations, complete laboratory activities, and engage in hands-on activities. Faculty identified two activities—watching lectures and engaging in class discussions with peers—as appropriate for both online and face-to-face environments.

Assessment of Needed Skills

To gauge faculty interest in developing new educational technology skills, we asked them how much they agreed (or disagreed) that better skills at integrating 17 different technologies into their courses could help them be more effective instructors. Faculty consistently agreed or strongly agreed that training in the use of *classroom* technologies could make them better instructors (between 47% and 64% of faculty for each classroom technology; see figure 6). Faculty were comparatively less interested (between 34% and 45%) in learning to leverage *student-owned* technologies (e.g., laptops, tablets, social media, and smartphones) in the classroom to improve instruction. *Emerging* educational technologies elicited varying levels of interest, from a mere 25% for 3D printers to 57% for simulations and educational games.

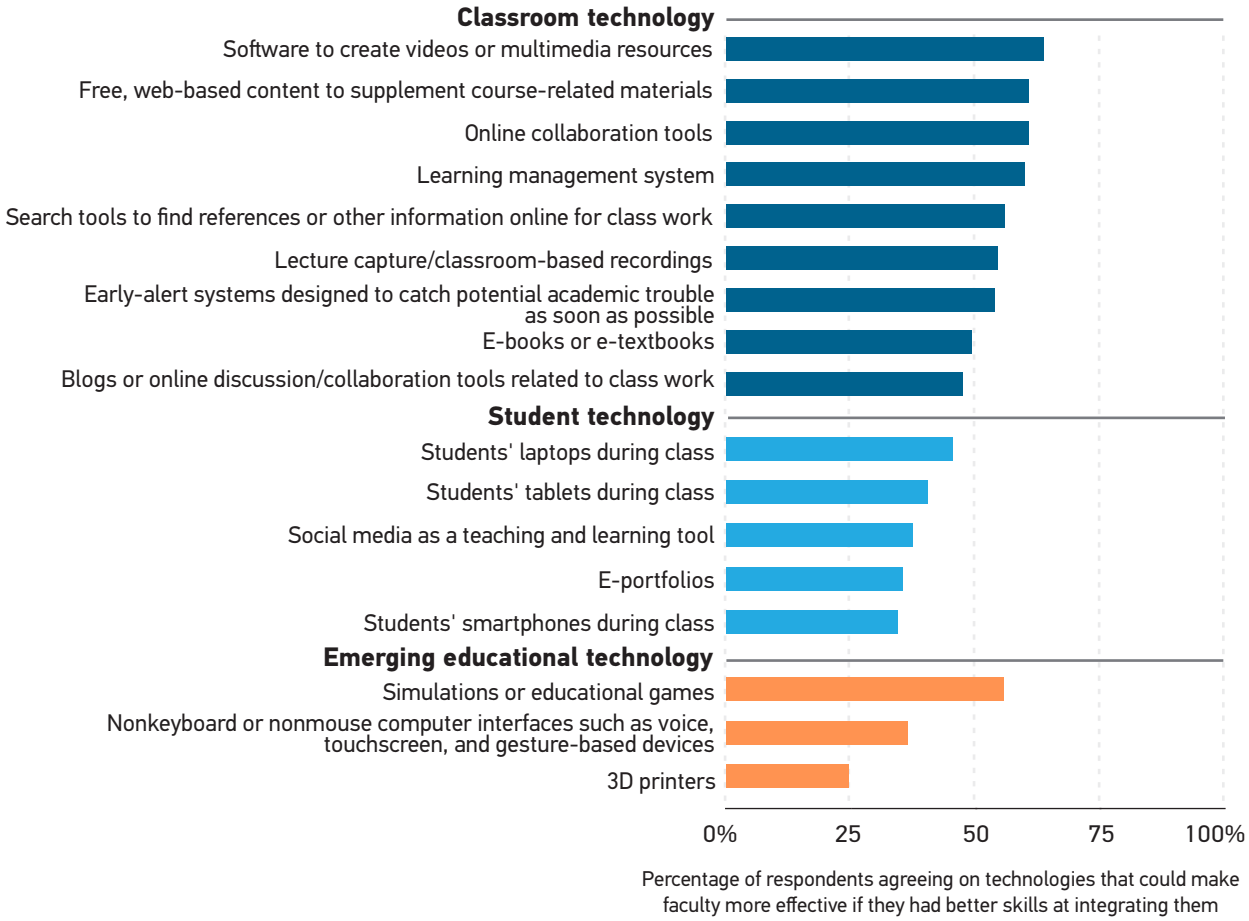

Figure 6. Level of agreement on technologies that could make faculty more effective if they had better skills at integrating them

About half of the technologies we asked about were agreed upon by a majority of faculty as potential boons to their teaching; most were established classroom technologies. The appeal of these technologies was also fairly consistent across institution types, with the top items—multimedia software (64%), free, web-based content (61%), online collaboration tools (61%), and learning management systems (LMSs) (60%)—all ranking high at AA, BA, MA, and DR institutions. The only emerging technology for which a majority of faculty expressed an interest was simulations or educational games, a percentage that may have been influenced by the degree to which the gamification of learning has been hyped in recent years.[5] What is more surprising here is that because they tend to perceive student technologies as a distraction, many faculty are still reluctant to embrace technologies as potential catalysts despite the increasing popularity of the BYOD approach.[6] Compared with 2014, we observed substantial negative shifts in interest in using certain classroom and student technologies: e-books or e-textbooks, e-portfolios, tablets, and social media.

When asked what their institution could do to better facilitate or support their teaching roles, faculty made a strong call for more training in the use of teaching technologies. More than 15% of respondents isolated training as the most pressing need; support was also cited as a major need, often in conjunction with training. With faculty demand for instructional training and support this high, institutions might consider increasing the availability of these opportunities, especially for the more frequently mentioned technologies that are not already in use on their campuses.

Faculty Motivators

Our data suggest that faculty across all institution types generally agreed on a cluster of motivators for integrating more or better technology into their teaching practices and curricula. As we observed in 2014,[7] the unanimous top motivator (see figure 7) is having a clear indication or evidence that students would benefit from the integration of the technology into courses or curricula.

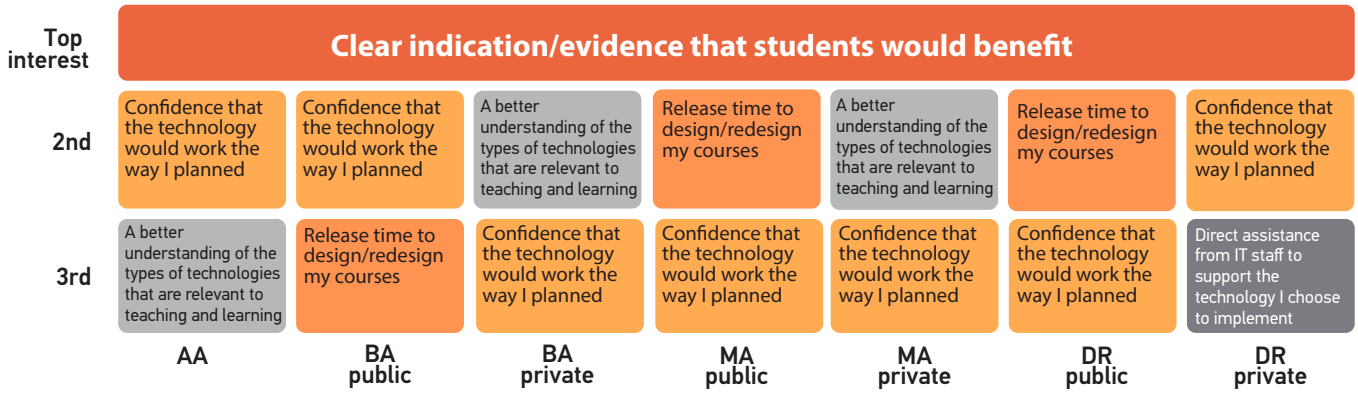

Figure 7. Top motivating factors to integrate technology into teaching or curriculum, by Carnegie class

The good news is that there is plenty of evidence available for those who want it and know where to look. However, the venues that publish research on the impact of educational technology on teaching and learning may be unfamiliar to many faculty, and good research is often obscured by disciplinary silos. Such publications are not merely excellent resources for acquiring evidence and gathering ideas but are also excellent venues for publishing one's own research on the impact of technology on teaching and learning. In addition to web-based searches, librarians serve as invaluable resources in helping identify and locate educational technology research. Figure 8 shows the ranking of all the motivators we asked about.

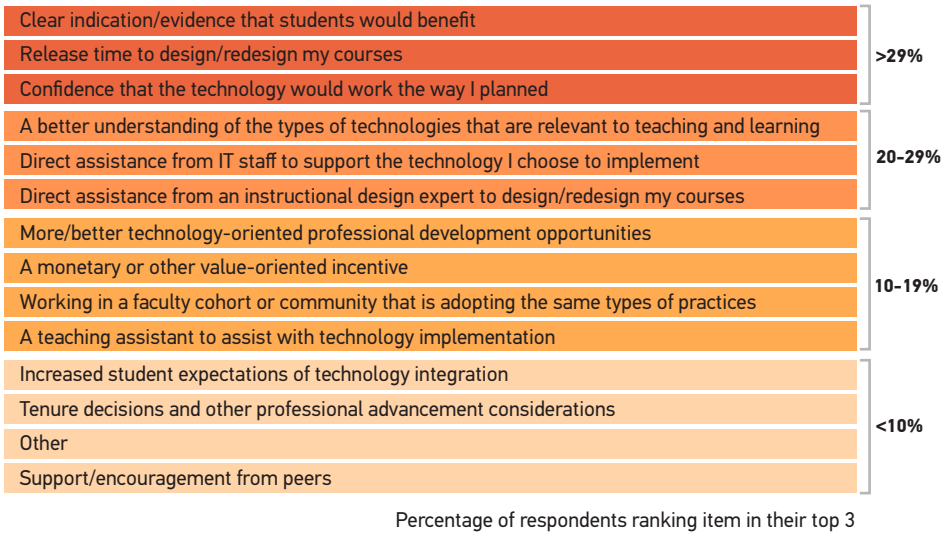

Figure 8. Ranking of all motivating factors mentioned in the survey

As in 2014, faculty are motivated by the prospect of having release time to design or redesign their courses. The relative importance of time compared with more direct forms of compensation such as monetary or other value-oriented incentives suggests that time is a faculty member's most important resource. Release from regular duties would likely hasten the speed of adoption or increase the scope of creative uses of classroom technologies. In the meantime, many faculty engage in course transformations without release time by making small and gradual changes to their teaching approaches. Although incentives may not always be necessary or sufficient to encourage faculty innovation, the provision of release time and/or money demonstrates an institutional commitment to teaching with technology and may motivate some faculty to innovate.[8]

Another faculty motivator is being assured that the technology one plans to use works in the manner intended. Faculty members expect classroom technologies to be reliable, functioning as intended from classroom to classroom. We also speculate that the consistency of this item across institution types may indicate a desire for classroom technologies to be relatively uniform while accounting for variations in disciplinary need. Although uniformity does not necessarily produce reliability, the presence of familiar technology that functions properly is something that faculty clearly want and need.

Faculty also claim that they would be motivated by a better understanding of the technologies that are relevant and useful in teaching and learning. However, we know that opportunities for acquiring such knowledge are ubiquitous in American higher education. Relevant data from the 2014 EDUCAUSE CDS indicate that nearly all institutions provide:

- faculty the option of individual training in the use of educational technology (99%)
- group faculty training (97%)
- instructional technologists to assist faculty and instructional designers with integration of technology into teaching and learning (93%)

Central IT also commonly offers intensive support for faculty who are heavy users of instructional technology (84% as of 2013); instructional designers to help faculty develop courses and course materials (86%); a designated instructional technology center available to all faculty (79%); faculty teaching/excellence centers that provide expertise on technology (73%); and student technology assistants available to help faculty use technology (66%).

This apparent gulf between the provision and the desired acquisition of technology skills and knowledge might be explained in a couple of ways. On the one hand, it is possible that faculty simply may not be aware of the programs and events available, in which case the IT organization might rethink the way it advertises its offerings; on the other hand, faculty may know about the events but, as we saw above, simply do not have the time to participate, in which case the timing or modality of events might be changed or incentives for making the time to participate could be offered.

Standardization of presentation technologies offers a way to be more efficient with resources required to support classrooms, and may also help faculty move seamlessly from classroom to classroom without needing to familiarize themselves with different systems.

—*Betsy Tippens Reinitz, Director, Enterprise IT Program*

Perceptions of Student Device Use

Based on experience and perception, faculty think that students use their mobile devices differently depending upon the task at hand (see figure 9). Laptops, which have occupied positions of prominence on the student desk for several years, are perceived to be used by students more than other technologies for "productive" activities such as note-taking (57%), connecting with learning materials (52%), and using specialized software (33%). Smartphones, by contrast, are thought to be the least productive form of mobile technology, and only 11% of faculty think that smartphones are used to take notes, presumably because of their size. Similarly, just 14% think that students use them for specialized software (applications) or to access the Internet for directed in-class activities. Tablets, which lie between laptops and smartphones in terms of size and functionality, occupy the same middle ground in terms of faculty perceptions of how students use them for academic tasks.

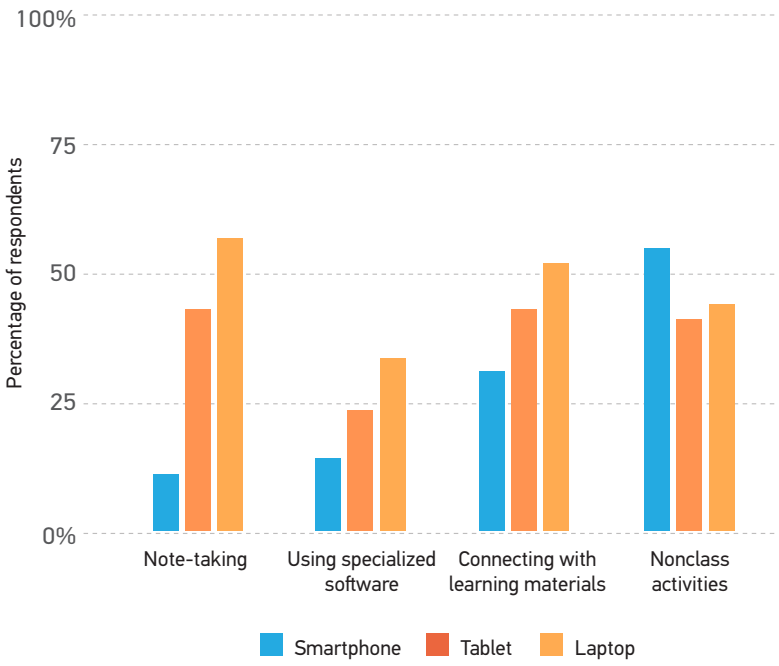

Figure 9. Faculty perception of how students use mobile technology in the classroom

Faculty generally see all technologies being used—at times—for things other than class-related activities. Smartphones, however, are seen as the devices most frequently used by students for nonclass activities (55%). The reason could be that in addition to the applications, software, and Internet distractions available across all devices, the smartphone also offers the opportunity for texting. Although laptops and tablets also enable chatting with others, students may use smartphones more frequently for this task, given that the size of the device implies, perhaps incorrectly, discretion.

Faculty perceptions are not entirely aligned with the way students report using their devices. In terms of smartphone usage, faculty are fairly accurate in perceiving that students use them to connect to course materials (36%) and to take notes (13%), but they overestimate their use for nonclass activities by 19%. Based on students' self-reports, faculty overestimate student use of laptops for accessing course materials by 7%, note-taking by 15%, and nonclass activities by 20%. The number of students who claim to use tablets to access class materials is 21% below faculty perceptions. Faculty perceive student use of tablets for note-taking and nonclass activities at rates approximately 2.5 and 4 times what students report for themselves, respectively. Even though perceptions of others and self-reported behaviors are not the most reliable or valid ways to obtain true measures of device usage, what is interesting (and important) are the gaps between what faculty think students do and what students claim to do. Dialogue between the two groups about appropriate use of personal devices could inform better classroom policies and facilitate the emergence of effective BYOD activities.

Views on Mobile Device Use in the Classroom

Faculty are highly ambivalent about the use of mobile technologies in the classroom. On the one hand, a majority of faculty think that mobile technology can enhance student learning (52%). Additionally, about one-third claim that they create assignments that take advantage of student access to mobile technologies. But only 14% reported that their institutions have made mobile learning an institutional priority (see figure 10). This diverges significantly from what institutions report in CDS: 68% said they offer faculty training on incorporating BYOD in class, and 41% said they encourage faculty to incorporate students' BYOD in class.[9] On the other hand, faculty have some strong reservations about using mobile technology in the classroom. Three-fifths view mobile technology as distracting for students, and nearly half of faculty see mobile technology as distracting for themselves. About two-fifths of faculty expressed concerns about security and privacy problems associated with mobile.

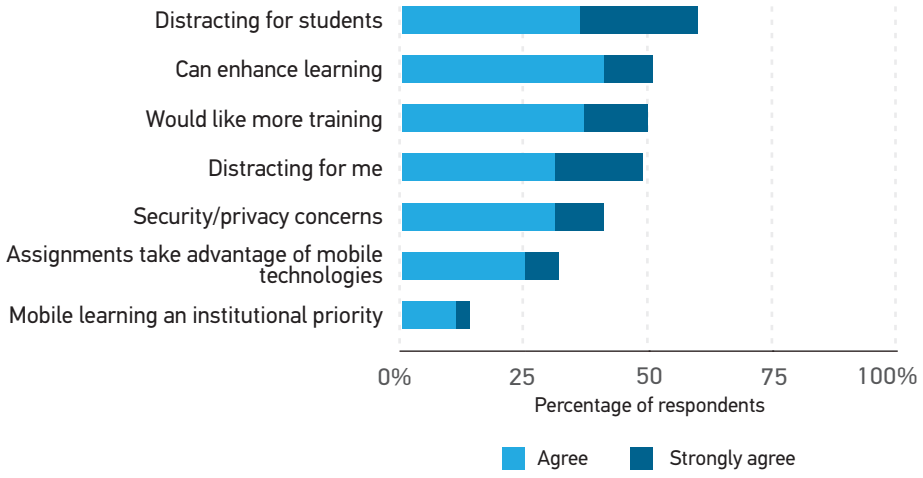

Figure 10. Faculty views on mobile technology in the classroom

However, half of faculty agreed or strongly agreed that they would like to have more training and professional development around effectively incorporating mobile devices into their courses, and about 15% referred specifically to mobile devices as technology with the greatest potential to have a positive impact on their faculty role. When combined with the aforementioned positive disposition and attitude of faculty toward IT and the motivation to develop a better understanding of how technologies are relevant and useful to teaching and learning, these findings suggest that faculty could develop a more positive perspective about the use of mobile technologies in their classrooms.

Percentage of undergraduate students who agree/strongly agree that in-class use of mobile devices can be distracting for...

...instructors = **54%**

...other students = **49%**

...me = **41%**

— ECAR Study of Undergraduate Students and Information Technology, 2015

The Challenge of Mobile Technology

The findings may indicate that institutional mobile-learning initiatives can be a challenge, and efforts toward building mobile access of core technologies can often be transparent to students and faculty. Mobile technologies are hardware and software that offer an array of pedagogical opportunities. They can facilitate students' interaction with content, each other, and the instructor through enterprise systems (LMSs, student response systems [SRSs], and e-text readers) or particular mobile applications, whether off the shelf or developed by the institution.

Often the faculty may interpret student access through their mobile devices as transparent, focusing more of their attention on designing the activity and aligning with the functionality of the software platform or application than on the supporting hardware. Personal technologies and broadband access may have become somewhat seamless in the eyes of faculty. This is particularly true of campus-wide technologies.

When it comes to more personalized mobile applications potentially facilitating student activities, the applications available on a mobile device are exhaustive. These applications can be used to create or consume content, facilitate peer-to-peer interactions, or allow faculty to more easily communicate and engage with students. Therefore, the idea that *hardware*—mobile technology— would drive an initiative is broad and all-encompassing. Institutions may want to consider focusing on pedagogical needs and goals while identifying how functionality offered by a mobile device, including web browsing or mobile application access, can help faculty meet these needs. For instance, if faculty members find mobile devices distracting and are looking to improve engagement in face-to-face classroom settings (which can be a challenge), it would be wise for the institution to take on an initiative that allows for the exploration of mobile learning pedagogies that facilitate the use of technology within the classroom to engage students (e.g., SRSs or clickers; social media, such as Twitter or backchannel for Classroom Assessment Techniques [CATs]; collaborative document note-taking activities; and so forth).

—Tanya M. Joosten, Director of E-learning Research and Development, University of Wisconsin–Milwaukee

BYOD Policies and Practices

Faculty perceptions of how students use various technologies and the ambivalence faculty have about using them in class are manifest in the way classroom policies and practices address those technologies (see figure 11). Two-thirds of faculty neither encourage nor discourage students from using wearable technologies, and about half do the same for tablets and laptops; only one-third take a laissez-faire approach with smartphones, however. As we might expect, smartphones are the technology most frequently banned (22%) or discouraged (27%) from use in the classroom, rates that are between 2.5 and 3 times greater than those for tablets and laptops, respectively. Conversely, tablets and laptops are 2 to 2.5 times more likely, respectively, than smartphones to be encouraged or required for in-class activities. The tendency to ban is fairly consistent across technology types; 20% of those who ban at least one mobile technology ban them all.

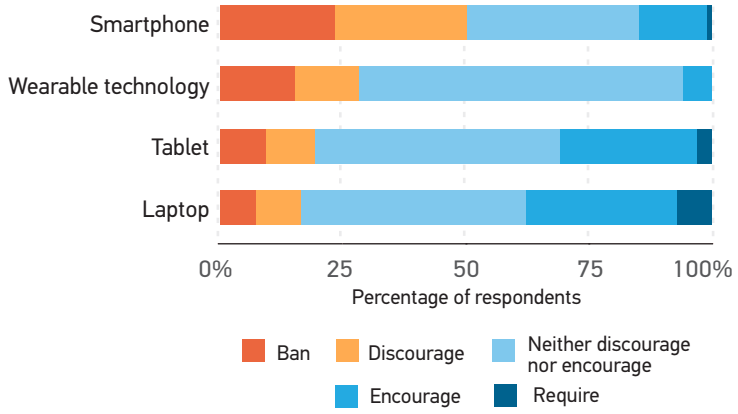

Figure 11. Faculty in-class BYOD policies and practices

What, if anything, predicts whether an instructor bans, discourages, encourages, or requires the use of mobile technology in the classroom? Controlling for faculty disposition, attitude, and usage, statistical analysis reveals a fairly consistent pattern. For smartphones, laptops, and tablets, the more a faculty member thinks that students use the devices for class-related activities (e.g., connecting with course materials or using specialized software or the Internet) or thinks that

such technologies can enhance the student learning experience, the more likely that person is to encourage or require the use of those devices. However, among faculty members who think the use of mobile technologies in the classroom is distracting either to students or themselves, the probability of the devices' being banned or discouraged increases significantly. Interestingly, faculty who think that students use laptops and tablets for note-taking, who create assignments designed to use them, and who agreed that they need more training in how to use technology in the classroom are significantly more likely to encourage or require their use; the same is not true of smartphones.

If institutions want to see student-owned mobile technologies, especially smartphones, leveraged by faculty in the classroom, at least three things need to happen:

- Colleges and universities need to develop mobile-learning initiatives that are well designed and supported.
- Evidence of the impact of mobile technologies on student learning needs to be marshaled to convince faculty that they are worthwhile and useful.
- Faculty need support and training in how to better design assignments and activities that use mobile technology so that the opportunities for extracurricular use of devices are limited.

Percentage of students who claim the following devices are banned or discouraged:

Smartphones, **63%**

Tablets, **25%**

Laptops, **20%**

Wearables, **27%**

— *ECAR Study of Undergraduate Students and Information Technology, 2015*

Views on Students and Technology

A majority of faculty (60%) think that students have adequate technology skills for carrying out course activities. Still, nearly one-quarter (23%) perceive their students as having inadequate skills for their courses. Although faculty respondents expressed positive attitudes and dispositions toward IT and tended to report high rates of technology usage, there is probably room to improve student technology skills and close the gap between perception and reality.

In terms of using institutionally specific technologies (e.g., course registration system, the LMS, the library search system), a majority (55%) of faculty continue to wish that students were better prepared (see figure 12). Nearly half (46%) also said that students need to be better prepared to use basic software programs and applications (e.g., MS Office, Google Apps, etc.). A little over one-third (37%) of faculty agreed or strongly agreed that too many students look to them or their TAs for technology support to fulfill course requirements, an increase of 7 percentage points since 2014.[10] Students agreed somewhat with the faculty's evaluation of their skills; 42% wished they had been better prepared to use institutionally specific technology, and 33% wished they had been better prepared to use basic software programs. A concerted effort on the part of institutions to provide more student technology training during orientation and by IT units and faculty to publicize the appropriate resources for technology support throughout the academic year could work to change student behavior and improve skill levels.

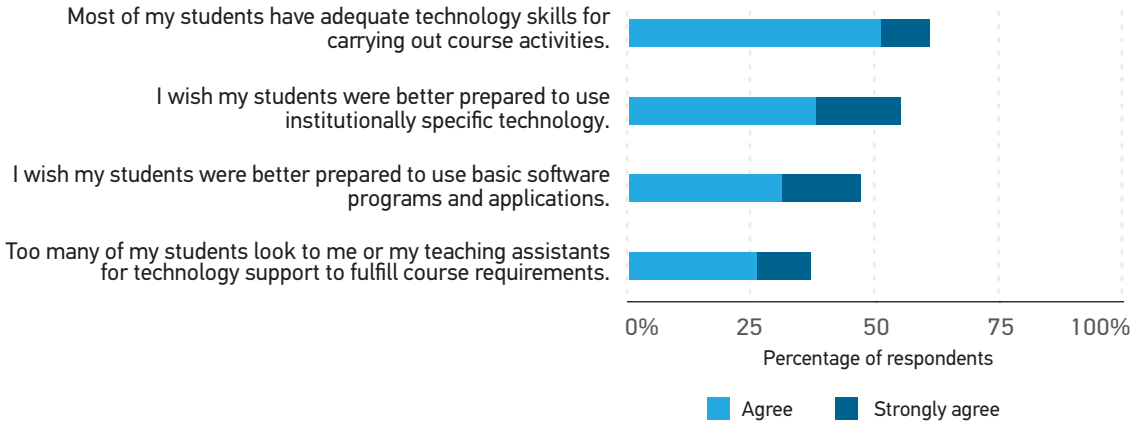

Figure 12. Faculty perceptions of students' technology skills

Faculty Views on Research

Faculty reported that they are generally satisfied with the research support they receive from IT staff but are less satisfied with the research services and software offered by their IT organization. However, when it comes to data-intensive research, faculty rate the computing resources available to them higher than their institutional cyberinfrastructure and the IT research support they receive.

Research Computing, Faculty, and IT: A Strategic Opportunity

Although the persistently low ratings for IT professionals' support of research computing is disappointing, it presents an opportunity for the CIO to become more strategic in this area.

This finding illuminates the need for IT units to better understand the tech support needs of faculty who conduct data-intensive research. Even with a large and/or distributed research faculty community, IT leaders should forge relationships with research faculty to establish mutual trust and respect. When IT professionals work collegially in a partnership model with research faculty rather than in a reactive support role, IT can be more of a strategic partner than a support-level "plumber."

The more informed IT leader will be in a better position to identify the intersection of data-intensive research and emerging technologies. The more connected research faculty community will have a direct conduit to IT to voice their needs, expectations, and experiences.

Over the past few years the higher education IT community has been evolving the CIO position to be less of a "plumber" and more of a "strategist." Supporting the research community in ways that are valuable to the faculty positions the IT leader as a strategist. At the end of the day, strategically oriented, collaborative, open-minded, proactive leadership based upon mutual trust and respect should lead to upward-trending satisfaction data.

—Stephen diFilipo, CIO, MSOE University

Institutional Research Support

Two in five (43%) faculty expressed satisfaction with their institutions' support for general research needs; about one-third are dissatisfied with the research support they receive. However, when examining specific forms of research support, we observe considerable variation in the responses (see figure 13).

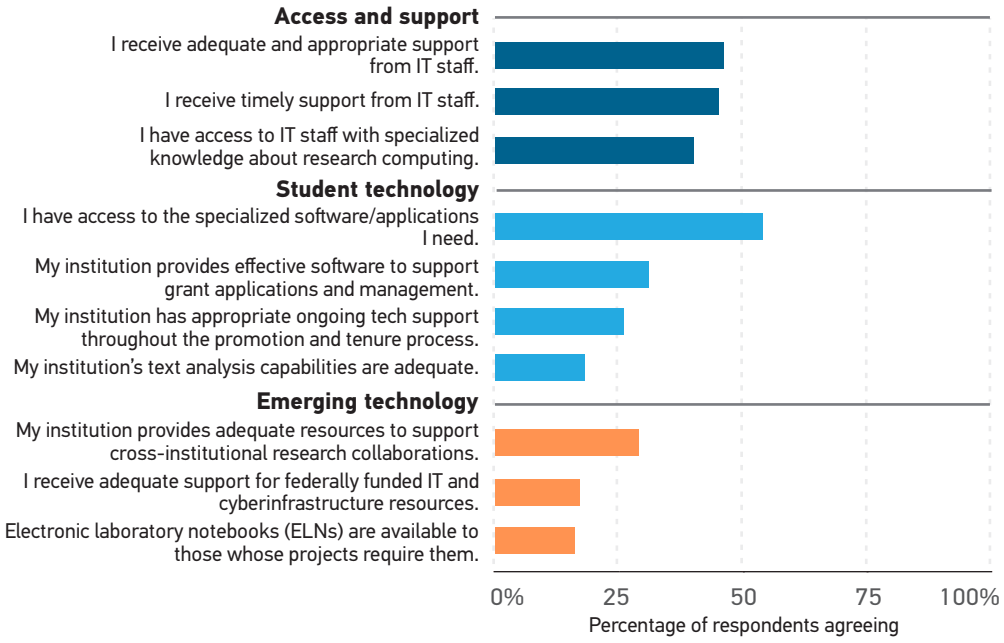

Figure 13. Faculty evaluation of institutional support for research

Responses to items related to access and support from IT staff track closely with general satisfaction. Just under half of faculty agreed or strongly agreed that they receive adequate and appropriate support (46%), as well as timely support (45%), from IT staff to conduct their research. The percentage of faculty who agreed or disagreed that they have access to IT staff with specialized knowledge about research computing in support of their academic disciplines is evenly split (40% each). About 10% of faculty explicitly identified the need for increased support staff, with some offering detailed research requests: "Provide actual full-time staff trained in the back-end of programming."

Faculty are less sanguine about their institution's software and services than about their access to and support by IT staff. Although a small majority (54%) of respondents indicated that they have access to specialized software and applications necessary for conducting research, other services do not fare as well. Less than one-third of faculty claim to have effective software to support grant applications and management (31%), appropriate procedures in place to ensure the provision of ongoing technology support throughout the promotion and tenure process (26%), and adequate text analysis capabilities (18%). Specific needs cited by faculty for institutions to better facilitate or support research were focused on data collection, access, analysis, and management; explicitly mentioned were "better opportunities for visualization of big data" and "data infrastructure and processing."

When it comes to infrastructure and equipment, especially as they relate to cross-institutional collaboration, more faculty disagreed than agreed that there is adequate support and access to needed resources. Only 29% of faculty agreed or strongly agreed that cross-institutional collaborations are supported, compared with 46% who disagreed or strongly disagreed; 55% of faculty disagreed or strongly disagreed that federally funded IT and cyberinfrastructure resources are adequately supported, while only 17% agreed or strongly agreed; and 63% disagreed or strongly disagreed that their institution makes electronic laboratory notebooks (ELNs) available to those whose projects require them, compared with 16% who agreed or strongly agreed.

Institutional Support for Data-Intensive Research[11]

When faculty evaluate their institution's support for data-intensive research, they are generally satisfied with the provision of research computing technologies (42% agreed/strongly agreed), but many also claimed that they do not have the IT cyberinfrastructure resources and support needed to effectively pursue their research (44% disagreed/strongly disagreed).

Faculty tended to rate well the computing resources available to them for data-intensive research. Most faculty claimed to have adequate network bandwidth available to conduct research (65%) and data storage for research initiatives (62%); fewer than half (45%) said they have enough computational resources at their disposal for research. Data visualization and data backup and restore are the two computing resources that are scarce, with about half of faculty saying that they do not have enough of these resources available to them. The best evaluation in this category comes on the resources side, with 3 out of 10 faculty saying that their institution provides adequate resources for data backup and data restore in the event of loss or corruption (see figure 14). However, over half (53%) of faculty respondents either disagreed or strongly disagreed that data backup and restore is adequate.

When we examine the specific items associated with IT personnel, we understand better why the cyberinfrastructure resources and support are rated so poorly. IT professionals are not rated favorably in terms of their support for data-intensive research projects. Faculty tend to think that IT professionals do not play an integral part in providing research computing services (61%) and are more reactive than proactive in responding to research computing needs (55%).

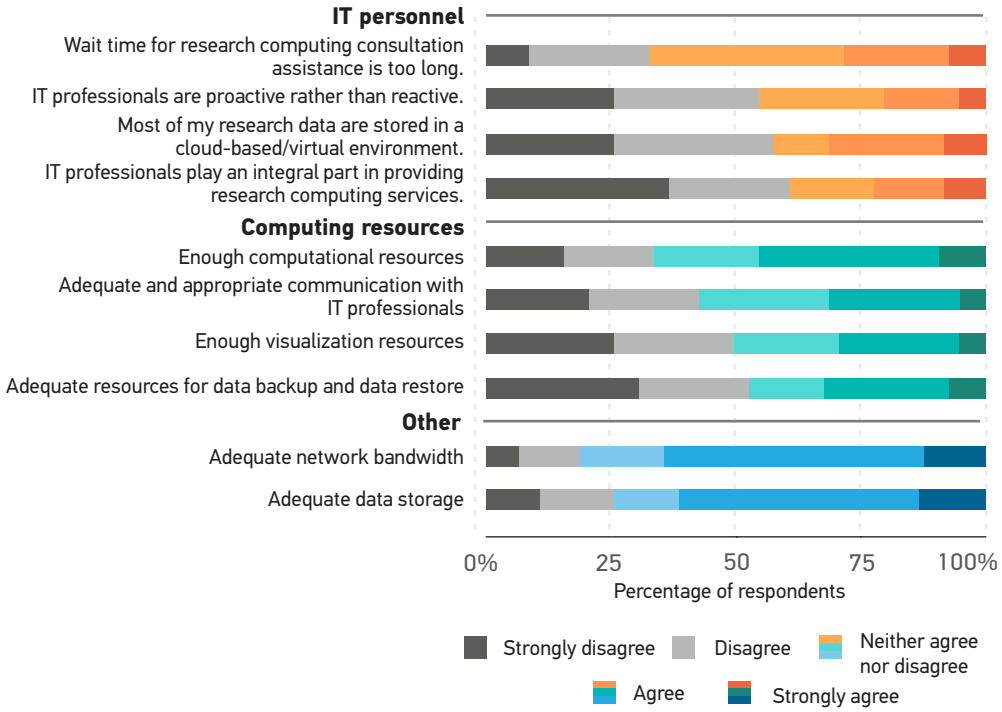

Figure 14. Faculty evaluation of institutional support for data-intensive research

Faculty Views on Campus Technologies

In this section we present faculty experiences with and evaluation of a number of campus technologies including the LMS, technology-enabled spaces, and integrated planning and advising services (IPAS) in higher education. We also present faculty opinions on whether the collection and use of different types of student data in the service of improving academic success is a good idea.

Use of Learning Management Systems

The manner in which faculty use their respective LMSs has not changed much since 2014. A majority (61%) of faculty continue to report using the basic features of the LMS to carry out the simple task of pushing out information to students (e.g., posting a syllabus or handouts). Again, faculty are underutilizing the more creative and engaging features of the LMS, with only 44% of faculty using the LMS to encourage interaction (e.g., student–student, student–content, student–instructor) outside the classroom using discussion boards, assignments, assessments, and other activities (see figure 15).

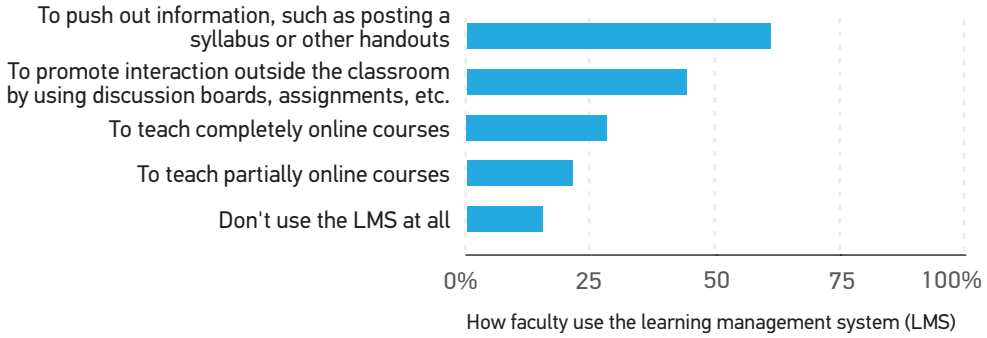

Figure 15. Typical faculty use of learning management systems

The importance of the LMS to instruction is demonstrated by the fact that a majority (63%) of respondents agreed or strongly agreed that the LMS is critical to their teaching. Furthermore, faculty tend to think that the LMS is a useful tool to enhance their teaching (74%) and student learning (71%).

What is consistent with previous findings—but surprising based on the ubiquity of the LMS (in 2014 99% of institutions reported having an LMS that had been in place for about eight years)—is that 15% of faculty reported not using their institution's LMS at all. Female faculty (88%) are slightly more likely to use the LMS than are male faculty (82%). Non-LMS users are about 3.5 years older and have about 2 more years of professional experience than LMS users—neither age nor teaching-experience differences can confirm the stereotypical generation gap of technology adoption and use. Faculty without tenure but who are on a tenure track are more likely to use the LMS (92%).[12] LMS users also tend to score significantly higher (by 5 to 6 points) in terms of disposition, attitude, and usage of IT.[13]

Satisfaction with Learning Management Systems

In terms of the more routine user experiences with the LMS, a majority of faculty expressed satisfaction (see figure 16). About three-quarters of faculty indicated that they were satisfied or very satisfied with their ability to post content, the availability of the system, and their ability to receive student assignments reliably. Three-fifths reported satisfaction with their ability to manage assignments, the general ease of LMS use, system response time, and their ability to enter student progress information (e.g., assignment grades or points, to-date cumulative grades or points) and monitor or manage course enrollments.

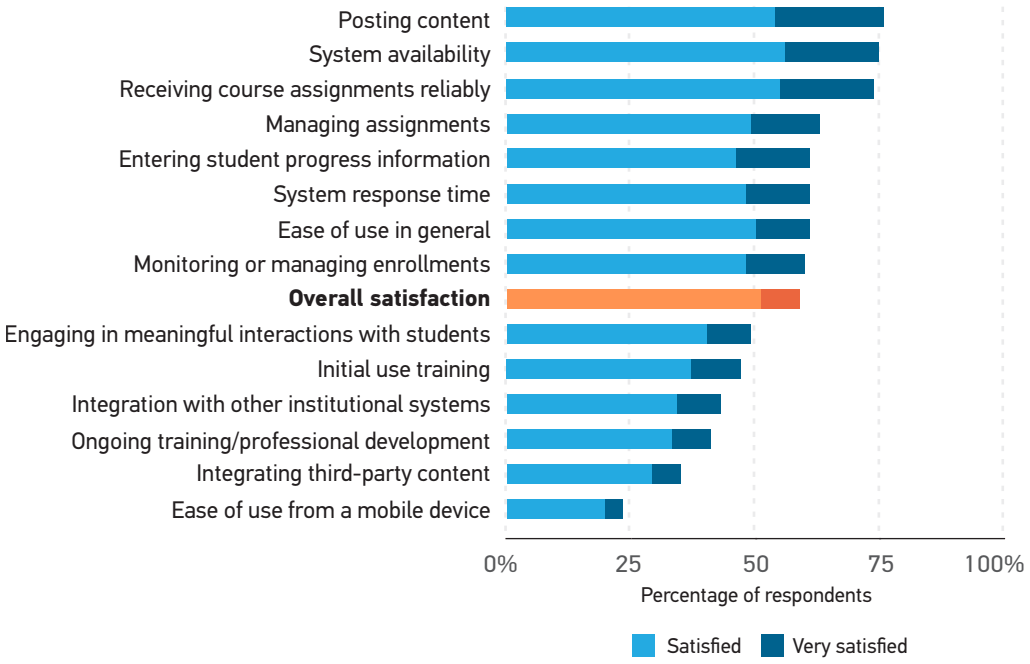

Figure 16. Satisfaction with learning management system features

About half of faculty reported being satisfied or very satisfied with being able to engage with students meaningfully via discussion boards, direct contact, or social media connections (49%). Coincidentally, faculty who use the LMS for interacting with students are significantly more likely to report being satisfied with that functionality. Faculty are comparatively less satisfied with more complicated technical aspects of the LMS such as integration with other institutional systems for populating courses and gradebook use (43%) or integrating third-party content such as publisher products and materials (35%). However, those who think the LMS is a very useful tool to enhance teaching and student learning are more likely to express satisfaction with institutional system integration, and those who think it is critical to teaching and enhances student learning are more likely to be satisfied with the integration of third-party content.

Fewer than half of faculty reported that they are satisfied or very satisfied with their initial LMS training (47%) or their ongoing LMS training and professional development (41%). Currently, 65% of central IT units have a hand in LMS training for faculty, either as the primary source (46%) or in conjunction with other administrative offices (19%). Another third of LMS training for faculty is divided primarily between other administrative offices (24%) and academic units (8%).[14] Given the sources of training, this finding suggests that although faculty development may not fit nicely within the current or future array of IT services provided, more and better faculty development opportunities may lead to improvements in how instruction and learning are conducted in the LMS environment. If faculty know how to better design assignments and more effectively use LMS features, we might observe increases in both user satisfaction levels and student learning outcomes.

Technology-Enabled Spaces

Whether faculty are working in online collaborative environments (e.g., LMSs or Google Docs), off campus (e.g., from home or while traveling or living in other states or countries), or on campus (e.g., teaching in classrooms, conducting research in laboratories, collaborating with students and/or colleagues), the majority rate their general experiences as either good or excellent.

While the levels of satisfaction with specific features of the LMS vary considerably, the range of satisfaction levels with specific classroom technologies is comparatively narrower. In fact, a majority of faculty indicated that they are either satisfied or very satisfied with a host of classroom technologies and features. When it comes to the variety of equipment and software, as well as the frequency with which they are refreshed or updated, a plurality of faculty are satisfied or very satisfied (see figure 17).

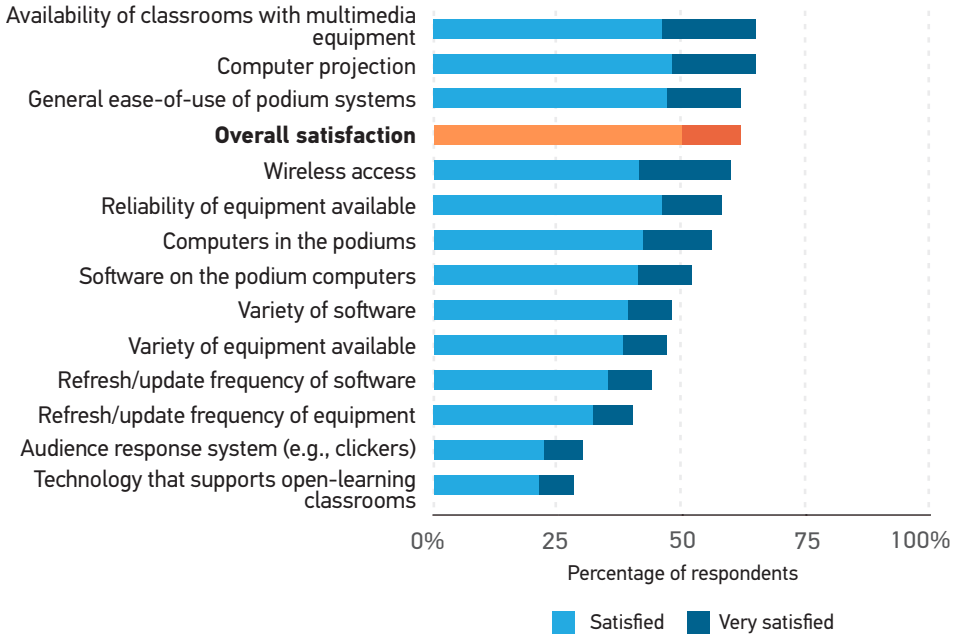

Figure 17. Faculty satisfaction with classroom technologies

The two items with which faculty are more dissatisfied than satisfied are technologies geared more toward student use: audience response systems (e.g., clickers) and technologies that support student learning (e.g., shareable monitors). Satisfaction levels may well be tied to how they are used instead of whether they function; that is, there is no reason to think that clickers or shareable monitors do not work, that they break down, and/or that they are not upgraded or refreshed as often as the other equipment we asked about. Instead, it seems plausible that what faculty require in order to be more satisfied with these classroom technologies may be what they desire for other student technologies: more training and professional development around effectively incorporating these technologies into their courses. That said, faculty may be less satisfied with these technologies because they depend on exogenous factors such as students' experience and expertise or infrastructure to function properly.

Student Analytics—A Good or a Bad Idea?

The capacity of institutions of higher education to collect and use students' data to enhance their educational experience and learning outcomes has been increasing substantially over the past decade. Some individual student data exist as artifacts of student applications and demographic information required of students who matriculate (e.g., test scores, high school GPA, national or state of origin, age, sex, and ethnicity); academic data are collected over the course of students' academic careers (e.g., course grades and college GPAs). Other kinds of behavioral and substantive data are available from the IT systems that support institutional business, faculty teaching, and student learning (e.g., e-mail systems, student/faculty/staff portals, LMSs, and student ID cards). And, increasingly, colleges and universities are monitoring their students beyond the classroom via social media and data from mobile devices.[15]

We asked faculty what they think about the processes of collecting and using two different types of student data. First, we wanted to know if the collection and use of academically related data to reach out to students about their academic progress and opportunities for training and/or guidance was a good or a bad idea. Second, we asked faculty if collecting and using nonacademic data harvested from social media and mobile devices to assess intervention strategies, enhance students' academic experiences, or tailor offerings to meet students' needs and expectations was a good or a bad idea.

On average, faculty are fairly neutral as to whether using institutional student data for interventions is good or bad (see figure 18). However, they are strongly opposed to harnessing personal student data from social media sites and mobile devices for the same purposes. Faculty are significantly more inclined to think that using traditional academic data from students is a good idea but that using data collected from students' mobile devices or social media platforms is not.

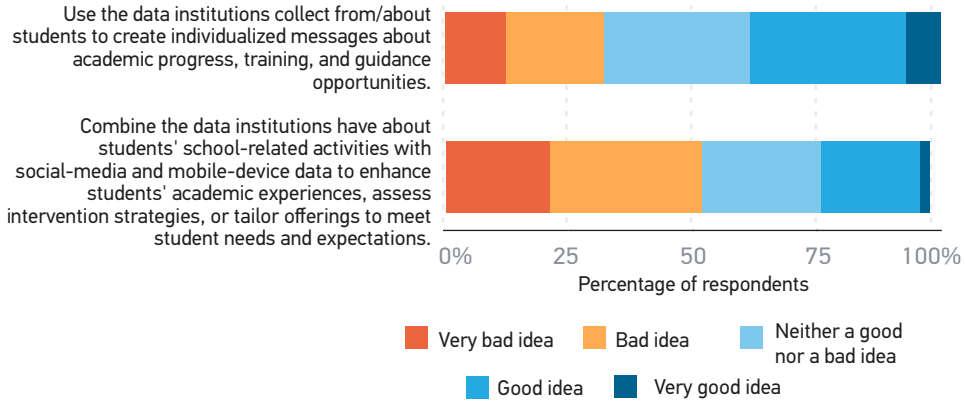

Figure 18. Faculty views on collecting and using student data

What Do Students Think?

58%

of students think that using their institutional data to inform them about academic progress, training, and guidance opportunities is a good or a very good idea.

32%

of students think that using their social media and mobile device data to enhance their academic experiences, assess intervention strategies, and provide tailored offerings to meet their needs and expectations is a good or a very good idea.

— ECAR Study of Undergraduate Students and Information Technology, 2015

Collection of Student Data

Faculty opinion on student data collection remained consistent even when we asked about specific types of data (see figure 19). A majority of faculty think that collecting and using student data about their progress toward degrees or certificate goals (79%), performance in current (70%) and past (63%) courses, and comparative performance data (51%) is a good idea. More official metrics such as GPA, majors and minors or concentrations, number of courses and credit hours completed, (comparative) course grades, and upcoming courses appear to be generally acceptable to faculty. However, faculty support begins to wane for student analytics drawn from IT usage analytics, extracurricular activities, or sources that seem Orwellian like social media and mobile devices. Of these types of data, faculty are more amenable to data tied to sources that seem more official, such as activity in institutionally provided applications or services (45%), activity on institutional websites (37%), or campus-based activities that require the use of officially issued student IDs (32%).

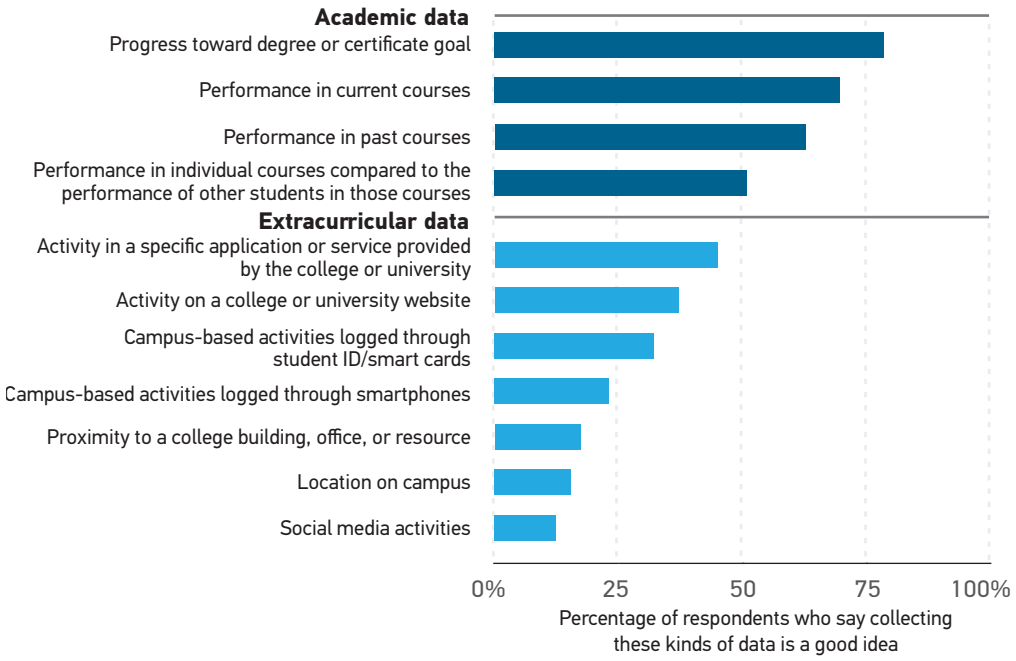

Figure 19. Faculty views on collecting and using specific types of student data

As the discussion turns to the harvesting of data from students' personal devices, faculty opinion drops precipitously. Only 23% of faculty think that data collected from student smartphones logged into campus activities is a good or a very good idea; 17% and 15%, respectively, think that using proximity and location data are acceptable; and only 12% think that monitoring students' social media data is a good idea. We should note here that in the *ECAR Study of Undergraduate Students and Information Technology, 2015*, student perspectives on these same items tracked very closely with faculty perspectives.

Integrated Planning and Advising for Student Success

When asked about an array of tools that comprise services known as IPAS, which use analytics to improve student success, faculty overwhelmingly indicated interest in such services and think that they are useful (figure 20).[16] This is true across all four dimensions of IPAS—education planning, progress tracking, advising and counseling, and early-alert systems.[17]

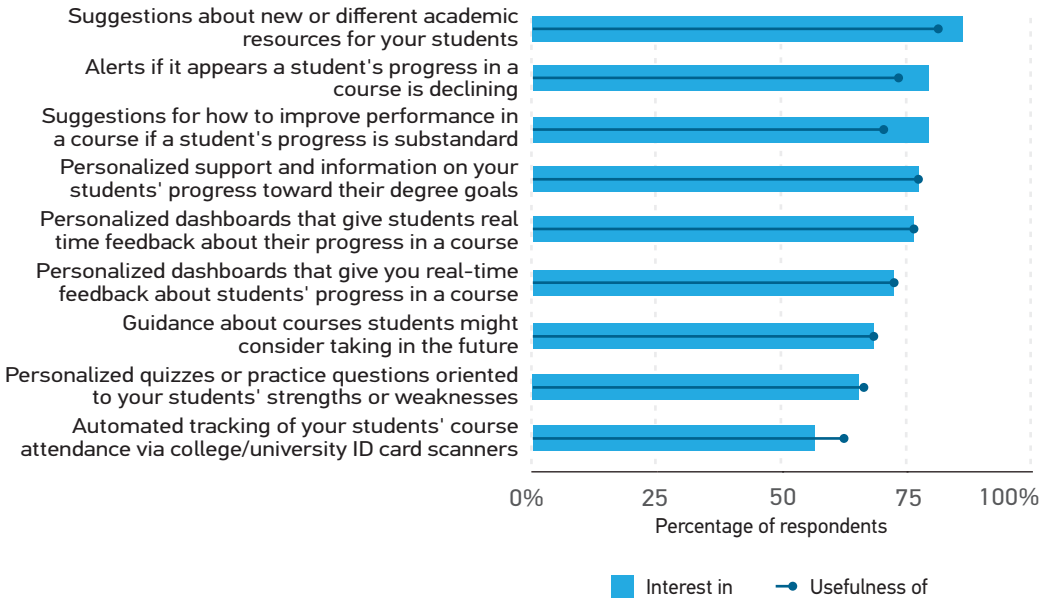

Figure 20. Faculty interest in IPAS features and evaluation of their usefulness

Faculty think that the ability to create counseling and advising opportunities by providing students with information about academic resources is the most interesting (87% reported at least moderate interest) and useful (82% reported at least moderate usefulness) feature of IPAS. Although faculty think that providing students with suggestions for how to improve their performance in courses is interesting (80%), fewer faculty think that such efforts will prove useful (71%). Faculty are equally interested (80%) in using student analytics to produce early alerts and are similarly confident about their utility (74%). Faculty have the same levels of interest in and perception of the usefulness of tracking student progress toward degree goals (78%) and using personalized dashboards that provide students (77%) and faculty (73%) with real-time data about progress in courses or learning experiences. Of the four IPAS domains, student planning has the weakest support; 69% of faculty expressed at least a moderate interest in and a moderate perception of the utility of providing students with information about courses they might take in the future.

These results vary little from the 2014 data, suggesting that faculty perceptions of IPAS tools for student success are stable and positive. Although faculty have some concerns about what kind of data are collected and how they might be used generally, it appears that faculty are highly supportive of student analytics to promote success in higher education. Such widespread support suggests that institutions might explore IPAS solutions more seriously to improve students' experiences in the classroom and beyond.

From a comparative perspective, it is worth noting that students' evaluation of the utility of IPAS also tracks closely with their interest in IPAS features. However, what students are interested in or find useful does not parallel the faculty evaluation. The IPAS feature in which faculty had the most interest and which they thought to be the most useful—suggestions about new or different academic resources—is the feature that ranks last among students. Personalized support and information on degree progress, the fourth item among faculty respondents, ranked first for students.

Faculty Views on the IT Organization

In this section we analyze faculty evaluation data for IT functions and activities, support services, sources of IT support, and privacy and security policies. We also consider the sources of technology support that faculty seek when they need it.

IT Functions and Activities

Faculty generally have a positive opinion about the functions and activities carried out by their respective IT organizations (figure 21). For the top 3 items, a majority of faculty either agreed or strongly agreed that their institution maintains a highly qualified staff (64%), is committed to supporting accessible or adaptive technologies for students with disabilities (61%), and supports faculty technology needs (53%). With the exception of three functions, a plurality of faculty agreed more than they disagreed on the remainder of the functions and activities we asked about.

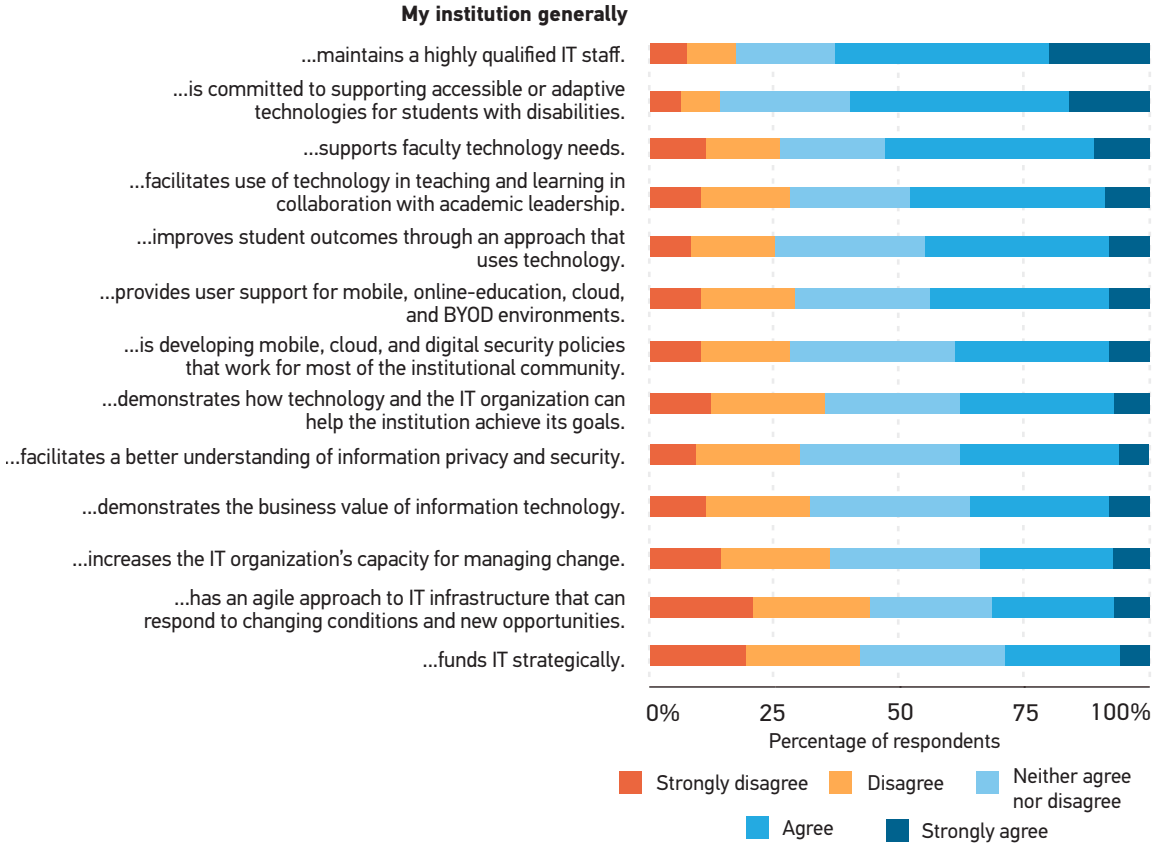

Figure 21. Faculty evaluation of IT functions and activities

For the bottom three items, more faculty disagreed or strongly disagreed than agreed or strongly agreed that their institution increases the IT organization's capacity for managing change (36% disagreed or strongly disagree), that IT is funded strategically (42%), and that IT is agile with regard to responding to changing conditions and new opportunities (44%)

What is particularly telling, however, is that on average 28% of faculty neither agreed nor disagreed with statements about the IT functions and activities we asked about; this is only 1% lower than the median percentage of those who disagreed or strongly disagreed with statements about the same functions and activities. We think this intermediate finding perhaps reflects the physical, psychological, or metaphorical distance between faculty and the work of IT organizations. It could also reflect ambivalence in their experiences with IT: Sometimes they have good interactions; sometimes they have bad ones. That is, the less experience and the fewer interactions that faculty have with IT, the less likely they are to have a meaningful opinion about IT functions and activities. This gulf between what IT does and what faculty experience suggests that opportunities exist for meaningful outreach to faculty and interaction between the service providers and clients.

This gulf between what IT does and what faculty experience suggests that opportunities exist for meaningful outreach to faculty and interaction between the service providers and clients.

IT Support Services

Although faculty may be removed from many IT functions and activities, the one domain in which they are most likely to interact with their campus IT organization is technology support services. And faculty experiences with technology support services tend to be positive, with either a majority or a plurality of faculty rating the services we asked about as good or excellent (figure 22).

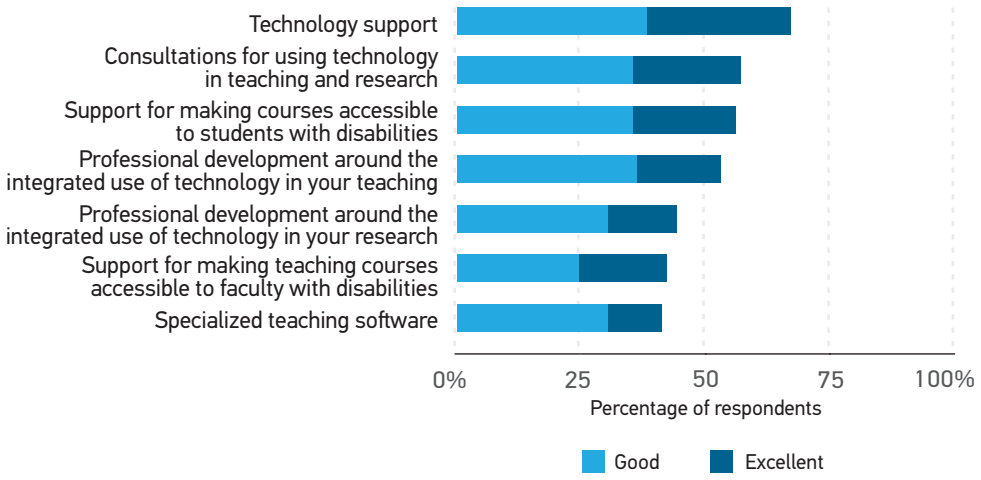

Figure 22. Faculty evaluation of technology support services

The highest-ranked IT support service is technology support itself (67%). Similarly, technology help desk services were rated favorably by 74% of respondents. When we examined different types of help desk assistance within this category, we found that a majority of faculty rated support by phone (72%), e-mail (69%), walk-ins (68%), and remote assistance/desktop (66%) good or excellent (not pictured). However, fewer than half of faculty rated web forms (48%) and chatting or instant messaging (47%) positively; the only help desk support that is rated negatively more often than positively is the self-service FAQ, a finding that suggests that the IT help desk practice of referring faculty to the FAQ or expending considerable resources to produce it is ill-advised.

We noted above the desire of faculty to have more and better opportunities for faculty development and training; faculty rate favorably their experiences in this area. Consultations for using technology in teaching and research were rated good or excellent by a majority of faculty (57%). Faculty rated more moderately professional development that focuses on integrating technology into teaching (53%) and research (45%).

The majority of faculty think that IT does a good to excellent job of making courses accessible to students with disabilities (56%), and many think the same about making courses accessible to faculty with disabilities (42%). These findings suggest that working closely with disability services may improve IT organizations' capacities to serve these institutional populations.

Sources of IT Support

Demonstrating a degree of technological confidence typically attributed to students, faculty reported that when they need technology support or assistance for school-related activities, they typically figure it out on their own (see figure 23).

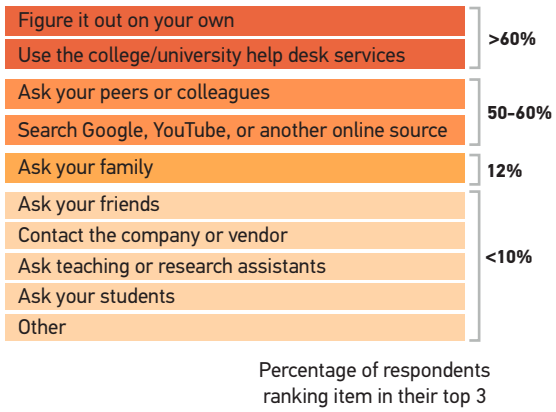

Figure 23. Where faculty turn for technology support or assistance

When faculty cannot resolve technology issues on their own, they turn to others on the basis of what appears to be expertise, trust, and efficiency. The second most popular option for faculty needing technology support is their institution's help desk services, an IT service that is well known and rated very highly by faculty. The next option for faculty is to discuss the issue with trusted peers or colleagues who may be familiar with the particular issue or problem and know of a possible solution. The Internet is the fourth most popular choice.

Although the relevant technology company or vendor may have the expertise, faculty are less enthusiastic about contacting them; companies and vendors are ranked number 7 out of 10 options, a ranking that is below the top options by as much as 58%. In fact, faculty are about as willing to ask friends, family, students, and teaching and research assistants as they are companies or vendors for help.

IT Privacy and Security

When asked about IT data and information privacy and security, faculty were on average much more positive about measures they take than the measures taken by their institution and IT organization (see figure 24). Nine of 10 faculty claimed to take sufficient privacy and security measures with regard to student data, and 8 of 10 claimed to do the same with their research data. Although 77% of faculty felt they understand institutional rules, state laws, and federal laws designed to protect information, fewer than half reported that they understand relevant policies related to data storage and use by third-party vendors. Given that the use of cloud-based technologies to deliver IT services is increasing and is expected to grow further, it would behoove IT organizations to educate faculty about how to use such tools prudently.[18] As with BYOD, this could be accomplished by collaborating with other units to promote user-awareness training and education programs that help faculty and staff better understand the risks of data exposure and the importance of security protocols.[19] Given that from 2005 to 2013, 33% of all data breaches in higher education resulted from unintentional human error, there is room for improvement on this front.[20] Presently, 71% of colleges and universities have mandatory information security training for faculty or staff.[21]

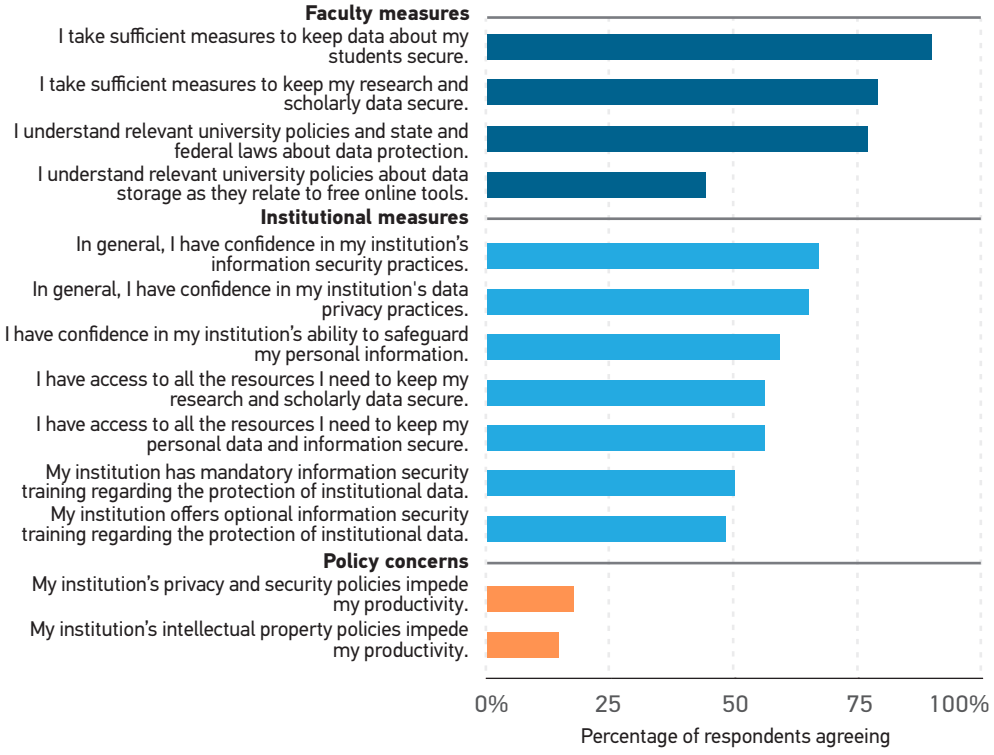

Figure 24. Faculty evaluation of privacy and security policies and procedures

A majority of faculty members expressed confidence in their institution's information security practices (67%), data privacy practices (65%), and ability to safeguard personal data and information (59%). A majority of faculty (56%) think that their institution provides adequate resources; half said their institution offers mandatory (50%) or optional (48%) training opportunities as they relate to data privacy and security. Fewer than one-fifth of faculty (17%) see their institution's privacy and security policies (e.g., two-factor authentication, complex passwords, key fobs, and biometrics) as obstacles to their assigned duties; only 14% see intellectual property policies as obstacles.

Conclusion

IT organizations have an opportunity to strike a strategic partnership with the faculty at their institutions to transform higher education in ways that improve student learning outcomes. Faculty are ready and willing to leverage their technological enthusiasm and expertise into the service of their students, departments, and institutions; IT organizations have the infrastructure and resources to facilitate this transfer. Where faculty say they want evidence of technology's impact on students, IT can help instructors locate research and facilitate the process of designing and publishing their own educational technology research. Where faculty demand more and better training and development opportunities, IT can identify general and specific areas of need and provide programs, training series, workshops, and information sessions. Where faculty identify shortcomings or lacunae in tools, services, and infrastructure, IT can respond by identifying direct solutions, alternative approaches, and areas for investment. If the gulf between what IT does and what faculty experience is indeed large, then the gulf between what faculty do and IT organizations experience with regard to faculty is large as well. 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

- Institutions should focus on providing faculty release time and/or monetary incentives while presenting clear evidence of the benefits of teaching and learning with technology. Although institutions already provide considerable development and training opportunities in using technology in pedagogically sound ways (as proven by research), more could be done to make them accessible to faculty on topics that are germane to their particular interests. Furthermore, IT organization can increase faculty satisfaction with and confidence in using core campus technologies by ensuring that they are consistent across campus and operate reliably. With faculty demand for instructional training and support high, institutions might consider increasing these opportunities, especially for the more frequently mentioned technologies that are not already in use on their campuses.
- To encourage faculty to leverage student-owned mobile technologies in the classroom, colleges and universities need to develop mobile-learning initiatives that are well designed and supported, help provide or point to evidence of the impact of mobile technologies on student learning, and offer support and training to better design assignments and activities that use mobile technology.
- Institutions should make a concerted effort to provide more student technology training during orientation and to publicize the appropriate resources for technology support throughout the academic year to change student behavior and improve technology skill levels.
- IT organizations should work with research faculty to understand what role they want IT to play in research computing. Improved communication between researchers and IT support might greatly improve the faculty research experience, especially for data-intensive projects. Furthermore, greater IT investment in research computing resources, especially data-intensive ones, would not only improve research capabilities but also demonstrate responsiveness to faculty concerns.
- Institutions should more seriously explore opportunities to leverage student data and analytics tools for student success because faculty both are interested in IPAS tools and perceive them as useful. These data suggest that institutions could move quickly with the faculty support that is critical to the success of implementing such projects and obtaining end-user buy-in.
- IT organizations should consider increasing or expanding their efforts to educate faculty about security and privacy issues, especially as they relate to cloud-based tools and services. User-awareness training and education programs that are built in conjunction with other functional units can help faculty and staff better understand the risks of data exposure and the importance of security protocols.

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 Internal Review Board process is successfully navigated and a sampling plan is submitted, ECAR provides each survey administrator 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 February 4 and March 20, 2015, and 13,276 faculty from 139 institutional sites responded to the survey (see demographic breakdown of institutions in table A and respondents in table B). 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. In exchange for distributing the ECAR-deployed survey to their faculty, participating colleges and universities receive files containing anonymous, unitary-level (raw) data of their faculty responses, along with summary tables that compare their faculty's aggregate responses with those of faculty at similar types of institutions. Participating in this survey is free, and any higher education institution can sign up to contribute data to this project by e-mailing study@educause.edu.

Table A. 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	23	17,139	2,246	13%	17%	19%
BA public	20	3,002	458	15%	3%	4%
BA private	4	652	98	15%	1%	1%
MA public	28	14,589	2,269	16%	17%	19%
MA private	16	8,067	1,862	23%	14%	15%
DR public	31	48,700	4,741	10%	36%	39%
DR private	4	3,665	396	11%	3%	3%
Total U.S.	**126**	**95,814**	**12,070**	**12%**	**91%**	**100%**
Canada	4	2,627	398	15%	3%	N/A
Other countries	9	8,576	808	9%	6%	N/A
Grand total	**139**	**107,017**	**13,276**	**12%**	**100%**	**N/A**

Table B. Demographic breakdown of survey respondents

Basic Respondent Demographics	U.S.	Canada	Other Countries
Under 50 years old	48%	47%	75%
50 years or older	52%	53%	25%
Male	46%	48%	59%
Female	54%	52%	41%
White	84%	N/A	N/A
Black	3%	N/A	N/A
Hispanic	4%	N/A	N/A
Asian	5%	N/A	N/A
Other/multiple	4%	N/A	N/A
Short survey version completed	73%	72%	70%
Long survey version completed	27%	28%	30%
Faculty Profile			
Percentage of respondents who primarily work with undergraduate students	84%	84%	72%
Percentage indicating experience with technology for teaching and learning	96%	98%	79%
Percentage indicating experience with research and scholarship	51%	37%	70%
Tenured	50%	59%	28%
Full professor status	29%	56%	13%
Associate professor status	25%	16%	9%
Assistant professor status	23%	11%	10%
Clinical professor status	1%	0%	0%
Instructor status	11%	3%	7%
Senior lecturer	0%	2%	11%
Five+ years of full-time teaching experience	71%	68%	67%
Five+ years of any teaching experience	80%	76%	74%
Median years in a full-time faculty position	10	10	7
Mean years in a full-time faculty position	13	12	10
Full-time faculty member	72%	59%	90%
Part-time faculty member	28%	40%	10%
Teaching/Research Areas			
Agriculture	3%	4%	4%
Bio/life sciences	9%	7%	7%
Business	9%	20%	11%
Communications	5%	10%	3%
Computer/information sciences	5%	8%	19%
Education	12%	8%	10%
Engineering	6%	11%	31%
Performing arts	6%	3%	3%
Health science	14%	16%	6%
Humanities	13%	12%	9%
Liberal arts/general	9%	10%	3%
Manufacturing	1%	3%	3%
Physical sciences	10%	5%	17%
Public administration, etc.	2%	2%	2%
Social sciences, including history and psychology	15%	12%	9%
Other	9%	13%	8%

The quantitative findings in this report were developed using 12,070 U.S. survey responses, yielding a 1% margin of error. 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 $p < 0.0001$ level unless otherwise noted. Findings from the EDUCAUSE Core Data Service and the 2015 ECAR student technology study are included, where appropriate, to contextualize the findings. All student study data are calculated from the representative U.S.-only sample of 10,000 students used to produce the results in the student study report.

Acknowledgments

This study was made possible by the collective efforts of survey administrators from the 139 college and university sites that participated in the 2015 faculty study (see appendix A). Each representative secured institutional approval to participate in the study, provided sampling plan information to our team, and distributed the ECAR faculty survey link to their institution's faculty. This research is an example of a symbiotic partnership between ECAR and higher education institutions; it could not happen without your contribution. Thank you for your contributions to this second examination of faculty views of technology in higher education.

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

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Appendix A: Participating Institutions

Aalto University
Abilene Christian University
Adams State University
The American College of Greece
American University of Beirut
American University of Central Asia
Appalachian State University
Auburn University
Bethany Lutheran College
Brazosport College
Broward College
Bucks County Community College
California State Polytechnic University, Pomona
California State University, Channel Islands
California State University, Sacramento
California State University, San Marcos
Capital University
Central Connecticut State University
Central New Mexico Community College
Chandler–Gilbert Community College
Chatham University
City College of San Francisco
Clayton State University
Clemson University
Coppin State University
Dawson Community College
DeVry University
Eastern Illinois University
Estrella Mountain Community College
Fairfield University
Gallaudet University
GateWay Community College
George Brown College
Georgia College & State University
Glendale Community College
Grand Canyon University
Grand Valley State University
Greenville Technical College
Heidelberg University
Hofstra University
The Hong Kong Polytechnic University
Ithaca College
John Wood Community College
Joliet Junior College
Keene State College
Lake Superior College
Lawrence Technological University
LeTourneau University
Lipscomb University
Louisiana State University
Loyalist College
Marietta College
Marylhurst University
McGill University
Mesa Community College
Metropolitan State University of Denver
Michigan State University
Middle East Technical University
Montgomery College
Northern College
Northern State University
The Ohio State University
Old Dominion University
Oregon State University
Pace University
Paradise Valley Community College
Penn State Abington
Penn State Altoona
Penn State Beaver
Penn State Berks
Penn State Brandywine
Penn State DuBois
Penn State Erie, The Behrend College
Penn State Fayette, The Eberly Campus

Penn State Great Valley School of Graduate Professional Studies
Penn State Greater Allegheny
Penn State Harrisburg
Penn State Hazleton
Penn State Lehigh Valley
Penn State Milton S. Hershey Medical Center College of Medicine
Penn State Mont Alto
Penn State New Kensington
Penn State Schuylkill
Penn State Shenango
Penn State University Park
Penn State Wilkes-Barre
Penn State Worthington Scranton
Penn State York
Phoenix College
Rio Salado College
Saint Francis University
Saint Joseph's University
Salt Lake Community College
San Francisco State University
San Juan College
School of the Art Institute of Chicago
Scottsdale Community College
Sonoma State University
South Dakota State University
South Mountain Community College
Stonehill College
Tampere University of Technology
Tarleton State University
Temple University
Thomas College
Truman State University
Tufts University
The University of Arizona
University of Arkansas
University of California, Berkeley
University of Central Florida
University of Delaware
University of Florida
University of La Verne
University of Louisville
University of Maryland
University of Maryland, Baltimore County
University of Massachusetts Dartmouth
The University of Memphis
University of Michigan–Ann Arbor
University of Mississippi
University of Nebraska at Kearney
University of Nebraska Medical Center
University of Nevada, Las Vegas
University of New Mexico
University of Northern Iowa
University of Oregon
University of Pretoria
The University of South Dakota
University of Texas at Brownsville
University of Texas–Pan American
University of Trinidad and Tobago
University of Washington
University of Wisconsin–Superior
Wayne State College
Wayne State University
West Virginia University
Western Carolina University
Winona State University

Appendix B: Validity and Reliability of Semantic Differential Constructs

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

As in 2014, faculty were significantly more positive than negative in their disposition toward IT on every single item in this series. That is, faculty were significantly more likely to refer to themselves as IT enthusiasts, supporters, experimenters, technophiles, early adopters, cheerleaders, and radicals (see figure B1).

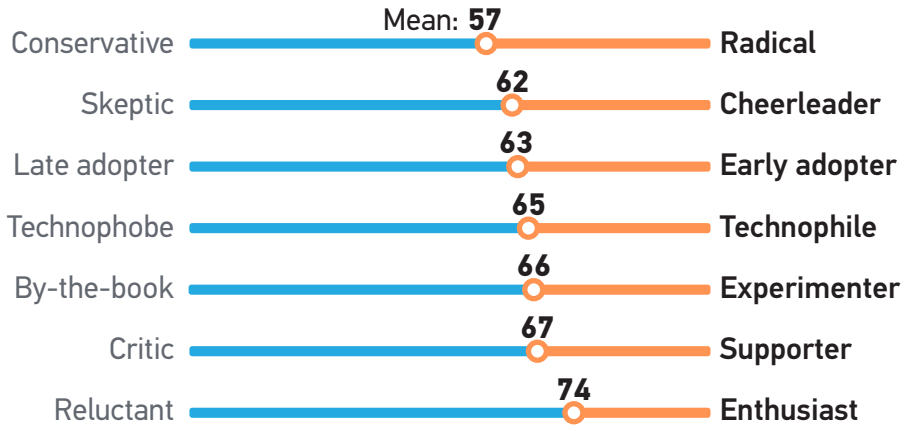

Figure B1. Faculty disposition toward technology

Faculty also had significantly more positive than negative attitudes toward IT. They found IT to be more useful, beneficial, and an enhancement than useless, burdensome, and a distraction. Moreover, faculty reported being more satisfied, content, and pleased than dissatisfied, discontent, and perturbed (see figure B2).

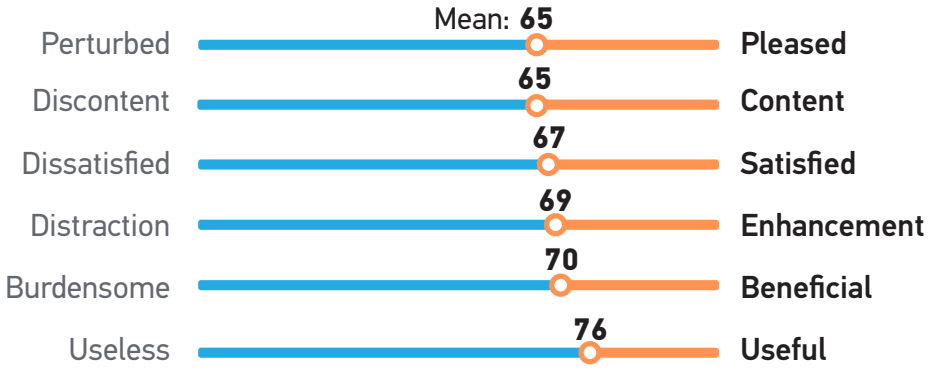

Figure B2. Faculty attitudes toward technology

Faculty also continue to report high levels of IT usage. They are more likely to be always connected, to be using technology frequently, to have technology occupy a central part of their lives, and to engage with new media (see figure B3).

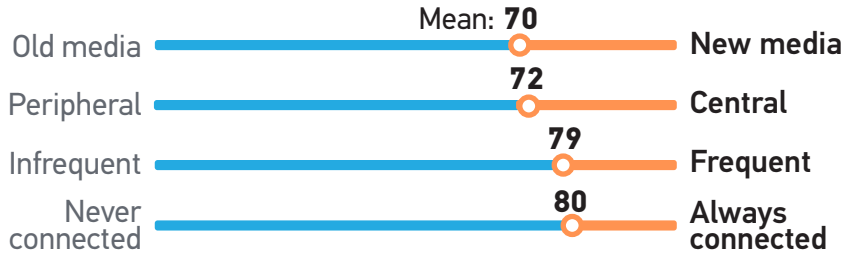

Figure B3. Faculty usage of technology

Although we established the face and construct validity of the semantic differential scales in the 2014 report on faculty and technology,[22] we felt compelled to repeat our analyses with the 2015 sample. This not only demonstrates the external validity (validity beyond the original sample on which it was established) of the semantic differential scales but also allows us to make sure that a minor adjustment to the usage scale (removal of the satiable-versus-insatiable item) did not disrupt the robustness of our findings.

To do this, we employed principal component analysis on the 17 items used to measure disposition, attitude, and usage. Three primary factors, all with eigenvalues greater than 3.67, were identified in the data. By rotating the factor matrix with the orthogonal varimax technique, using Kaiser normalization, we discovered that the items loaded discretely onto the appropriate factors as we had intended. Cumulatively, the three factors identified explained approximately 76% of the variance in the data.

To determine the reliability of our scale measure, we calculated a Cronbach's alpha (α) for each group of items based on their factor loadings from the factor analysis. Our results demonstrate that the items for each construct are highly reliable and improved from the 2014 version of the scales: disposition $\alpha = 0.91$, attitude $\alpha = 0.95$, and usage $\alpha = 0.93$.

Having (re-)established the validity and reliability of each construct, we again generated a new set of variables constructed from the unweighted average of the items for each respective construct. The mean value for disposition, attitude, and usage is significantly ($p < 0.0001$) above the 50% threshold of the scale in each case, suggesting that the overall pattern for faculty is positive. The number of respondents varies due to one or more missing data points for items within cases. Additional details about this statistical analysis are available upon request through study@educause.edu.

Appendix C: Demographics

Sex, age, and ethnicity. In terms of sex, the sample is somewhat skewed compared with the general population, with female respondents (54%) outnumbering male respondents (46%). The average age of faculty who responded to our survey was 50. The overwhelming majority of our respondents self-identified ethnically as white/Caucasian (84%); the remaining 16% is composed of Asian/Pacific Islanders (5%), Hispanic/Latino (4%), Black/African American (3%), and those who self-identified as other or multiple ethnicities (4%).

Experience, tenure, rank, and teaching. Respondents who participated in our study have an average 14 years of experience as faculty members. More than two-thirds of the faculty in our sample have tenure (50%) or are on a tenure track (19%); the remaining non-tenure-track faculty have either an ongoing appointment (20%) or a fixed-term appointment (12%). Three-quarters of faculty in our survey hold the rank of professor, associate professor, assistant professor, or clinical professor; another 16% identify their title as instructor or lecturer; the remaining 6% hold the rank of emeritus faculty, identify with another title, or hold no rank. On average, our faculty respondents teach about six courses per academic year. An overwhelming majority of respondents reported working with undergraduate students (84%), two-fifths work with graduate students (41%), and 13% with professional students.

Institutional affiliation. About 43% of our faculty respondents are employed at institutions that offer PhDs. Associate's, public master's, and private master's institutions each accounted for between 15% and 20% of faculty respondents. The smallest number of respondents we have by Carnegie class represents faculty at baccalaureate institutions (5%). Four-fifths of faculty teach and/or research at public institutions (80%). Of the remaining one-fifth, 12% reported being employed by private nonprofit institutions, and 7% work at private for-profit institutions.

Table C1. Institutional affiliation of respondents

Institution Type	Number (Percentage)
AA	2,246 (19%)
BA public	458 (4%)
BA private	98 (1%)
MA public	2,269 (19%)
MA private	1,862 (15%)
DR public	4,741 (39%)
DR private	396 (3%)

Notes

1. 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), 27, available from the ECAR 2014 Student and Faculty Technology Research Studies research hub.

2. Gartner, "Gartner Says Worldwide Traditional PC, Tablet, Ultramobile and Mobile Phone Shipments to Grow 4.2 Percent in 2014," press release, July 7, 2014.

3. Although there are no significant differences on these measures for most demographic categories and professional status, a few are noteworthy. First, women have an average attitude measure that is about 2 points higher than that of men on our 100-point scale. Similarly, Black/African American faculty members are significantly more positive (by about 7 points) in their attitude toward IT than other faculty. For disposition, Hispanic/Latino faculty are significantly more positive than others, by about 5 points on the 100-point scale. These findings mirror societal trends in enthusiasm for and usage of technology by women and minorities in recent years. And, although we do not have a clear explanation for why this might be the case, other studies have found that such patterns may be related to the ability of technology to empower them in their professional lives by providing greater access to knowledge.

4. Larry Johnson et al., *NMC Horizon Report: 2015 Higher Education Edition* (Austin, Texas: The New Media Consortium, 2015) 38–39.

5. Gartner, "Gartner's 2014 Hype Cycle for Emerging Technologies Maps the Journey to Digital Business," press release, Aug. 11, 2014.

6. Johnson et al., *NMC Horizon Report: 2015*, 36–37.

7. Dahlstrom and Brooks, *ECAR Study of Faculty and Information Technology*, 25–26.

8. Robert Kaleta, Karen Skibba, and Tanya Joosten, "Discovering, Designing, and Delivering Hybrid Courses," in *Blended Learning: Research Perspectives*, eds. Anthony G. Picciano and Charles D. Dziuban (Needham, MA; Sloan Consortium, 2007); and Tanya M. Joosten, Dylan Barth, Lindsey Harness, and Nicole L. Weber, "The Impact of Instructional Development and Training for Blended Teaching on Course Effectiveness," in *Research Perspectives in Blended Learning*, eds. Anthony G. Picciano, Charles D. Dziuban, and Charles R. Graham (New York: Taylor and Francis, 2013).

9. EDUCAUSE Core Data Service, 2014.

10. Ibid.

11. The data in this section are provided by the 37% of research faculty who indicated that they conduct data-intensive research.

12. Approximately 15% of tenured faculty reported not using the LMS, compared with 8% of tenure-track faculty, 13% of faculty not in a tenure track but with an ongoing appointment, and 16% of faculty in fixed-term, non-tenure-track positions. About 17% of full professors do not use the LMS at their institution. Compare that with 12% of associate professors and 9% of assistant professors.

13. All comparisons are statistically significant at the $p < 0.0001$ level.

14. EDUCAUSE Core Data Service, 2014. Module 3, Q1r.

15. For more information on analytics, see Jacqueline Bichsel, *Analytics in Higher Education: Benefits, Barriers, Progress, and Recommendations*, research report (Louisville, CO: ECAR, August 2012), available from the ECAR 2012 Analytics in Higher Education research hub.

16. See the ECAR Integrated Planning and Advising Services (IPAS) research hub for more information.

17. D. Christopher Brooks, *IPAS Implementation Handbook*, research report (Louisville, CO: ECAR, October 2014), available from the ECAR Integrated Planning and Advising Services (IPAS) research hub.

18. Jacqueline Bichsel, *IT Service Delivery in Higher Education: Current Methods and Future Directions*, research report (Louisville, CO: ECAR, April 2015); and D. Christopher Brooks, *The Changing Face of IT Service Delivery in Higher Education*, research report (Louisville, CO: ECAR, August 2015). These reports provide more information on the increased role of cloud computing and outsourcing in higher education IT service delivery models; both are available from the ECAR IT Service Delivery in Higher Education research hub.

19. Eden Dahlstrom and Stephen diFilipo, with foreword by Mark Askren, *The Consumerization of Technology and the Bring-Your-Own-Everything Era of Higher Education*, research report (Louisville, CO: ECAR, 2013), available from the ECAR BYOD and Consumerization of IT in Higher Education research hub.

20. Joanna L. Grama, "Just in Time Research: Data Breaches in Higher Education," research brief (Louisville, CO: ECAR, 2014).

21. Joanna L. Grama and Leah Lang, *CDS Spotlight: Information Security*, research bulletin (Louisville, CO: ECAR, July 3, 2015).

22. Dahlstrom and Brooks, *ECAR Study of Faculty and Information Technology*, 54–55.