

A man with glasses, wearing a blue button-down shirt and a dark blazer, is smiling and holding a tablet. He is in a classroom setting with other students blurred in the background.

Study of Faculty and Information Technology, 2014

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EDUCAUSE

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Foreword

Students and faculty are arguably the most important consumers of college and university IT services. Understanding their experiences and expectations can help higher education optimize the impact of IT. ECAR has been conducting research on students and information technology since 2004. In 2014, ECAR expanded this research to include the faculty perspective. Faculty are key to student success and integral to fulfilling the research and scholarship mission of colleges and universities. Considering the faculty IT experience is critical to understanding the overall ecosystem of information technology in higher education.

The findings of this research into the faculty community reinforce the promise of technology for the academic community. Faculty see technology as a valuable tool in traditional classroom settings, in research labs, and across digital environments, reshaping delivery systems, instructional models, and expectations. They are motivated to use technology more effectively—most say they are open to professional development to improve their knowledge about available technologies and, more importantly, about how to better integrate technology into their professional roles.

Technology is a critical part of learning environments, both in traditional brick-and-mortar classrooms and digital learning environments. In order for faculty to use technology to deepen engagement for students and collaboration among colleagues, institutions must have the appropriate infrastructure, integration (e.g., of data and systems), and design for the overall technology environment. These report findings can catalyze the conversations among IT professionals about how to better serve their constituents; among institutional leaders about how to use technology strategically; and among faculty about how to articulate their technology needs and expectations. The findings also provide an understanding for frontline technologists, academic innovators, and technology leaders to meet faculty where they are to best support the institutional mission.

This work is not just about understanding the technologies made available through colleges and universities but about what the consumers of these technologies do with them, whether that be automation, analytics, personalization, or transformation. The faculty study provides direction to IT units aspiring to integrate information technology in a way that provides seamless technology experiences for faculty and that fulfills the promise that technology brings to higher education.

Diana Oblinger, EDUCAUSE

Executive Summary

In this inaugural year of the faculty technology study, ECAR partnered with 151 college/university sites yielding responses from 17,451 faculty respondents across 13 countries. The findings are exploratory in nature, as they cover new ground to help us tell a more comprehensive story about technology experiences and expectations in higher education. ECAR's annual student technology study gives us the student perspective, the EDUCAUSE Core Data Service gives us the institutional perspective, the ELI Content Anchor Survey gives us the teaching and learning community perspective, and the EDUCAUSE Top 10 IT Issues list gives us the IT leadership perspective about what matters most so that we can optimize the impact of information technology in higher education. The results of the faculty study are connected to these other resources throughout the report to provide a multidimensional perspective about the meaning and potential impact of the findings.

Five of the nine key findings are directly related to improving student outcomes, which aligns with the first item on the Top 10 IT Issues list (improving student outcomes through an institutional approach that strategically leverages technology) and the #1 ELI content anchor (assessment of student learning). Faculty realize the value of online learning, especially with regard to providing students access to education. Faculty also recognize the potential of learning analytics to act as an early alert or intervention system to flag and redirect substandard progress in coursework. Faculty understand the value of learning management systems and are interested in better utilizing LMS features in their courses. Faculty acknowledge that they could be more effective instructors if they were better skilled at integrating various kinds of technology into their courses, including using mobile devices to enhance learning. These key findings are:

- **Faculty recognize that online learning opportunities can promote access to higher education but are more reserved in their expectations for online courses to improve outcomes.** Online teaching experience is moderate, and faculty with some online teaching experience have more positive attitudes toward learning that has web-based components, including the potential value of MOOCs to higher education.
- **Faculty interest in early-alert systems and intervention notifications is strong.** The highest level of interest in learning analytics is in correcting substandard student progress in current coursework.
- **The majority of faculty are using basic features and functions of LMSs but recognize that these systems have much more potential to enhance teaching and learning.** Although satisfied with their general LMS experience, many faculty express interest in being better skilled at integrating the LMS into their courses.
- **Faculty think they could be more effective instructors if they were better skilled at integrating various kinds of technology into their courses.** The

primary motivation for doing so is improving student outcomes, rather than influencing direct compensation or tenure decisions.

- **Faculty recognize that mobile devices have the potential to enhance learning.** They also think that balancing the academic use of mobile devices with the potential distractions these devices bring to the classroom is a key issue to address in higher education.

The remaining four findings help round out faculty technology experiences and expectations across the institution:

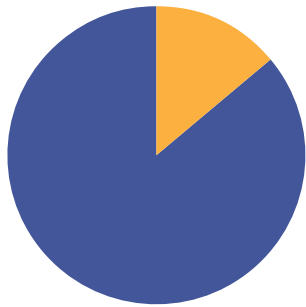
- **Faculty are more pleased with the technology resources used in personal work spaces than with the technology resources used in (or to create) collaborative work spaces.** When it comes to classroom-based technologies, the greatest levels of satisfaction are with basic classroom technologies such as projection systems and wireless access; the lowest levels of satisfaction are with how frequently the hardware and software in the classroom are refreshed.
- **The majority of faculty rely on the institution's help desk for technology support.** Help desk service satisfaction ratings were high for most modalities of service and highest for phone, walk-in, and e-mail.
- **Most faculty are confident about their ability and actions to keep student and scholarly data secure.** However, only about half of faculty have confidence in the institution to safeguard data and information.
- **Research faculty reported positive experiences with bandwidth and data storage, but ratings are generally lower for other types of research support.** Some of the concerns point to gaps in general university processes and procedures, whereas other concerns are directly related to faculty experiences for specific IT support.

The broad thematic message with regard to faculty's view of technology is one of promise and opportunity. Faculty are clearly dedicated to using technology in innovative ways that will support student learning. They are also open to professional development opportunities to help them incorporate technology more and more effectively into their classes. IT units must find the sweet spot that connects the interest and motivation that technology inspires in faculty with the opportunities for faculty to grow their own practice. IT leaders and staff can provide strategic and tactical forms of support, respectively, both of which are necessary to bridge the gaps between available technologies and the application of these technologies into teaching and learning practices.

IT units must look for ways to meet faculty expectations of access to appropriate and dependable technologies to support their teaching and research. They must also lead innovation by introducing new technologies to faculty, who do not see themselves as technology detractors. IT leaders who make faculty adoption easy and sustainable will meet faculty where they are now and help catalyze further technology innovation.

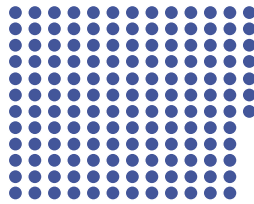
Introduction

The EDUCAUSE Center for Analysis and Research (ECAR) has conducted research on undergraduate students and IT since 2004 and in 2014 extended this research to include the perspectives and experiences of faculty. The faculty study is part of ECAR's scaled expansion of technology research in the academic community to allow for a more comprehensive understanding of technology as a critical part of teaching and learning environments. In this inaugural year of the faculty study, 17,451 respondents from 151 survey sites in 39 U.S. states and 13 countries participated in the research (see figure 1). The overall response rate was 15% of the population surveyed, which is low but not atypical for online surveys. 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 ranks (e.g., full professors, associate professors, lecturers, and instructors). The findings in this report were developed using the full data set and are broken out by institution type, region, and faculty type as appropriate to communicate accurate and meaningful results. Preliminary data from the 2014 student study, historic data from past student studies, institutional data from the EDUCAUSE Core Data Service (CDS), and data from scholarly literature are included to contextualize the results as a broader story of technology experiences in the academic community.

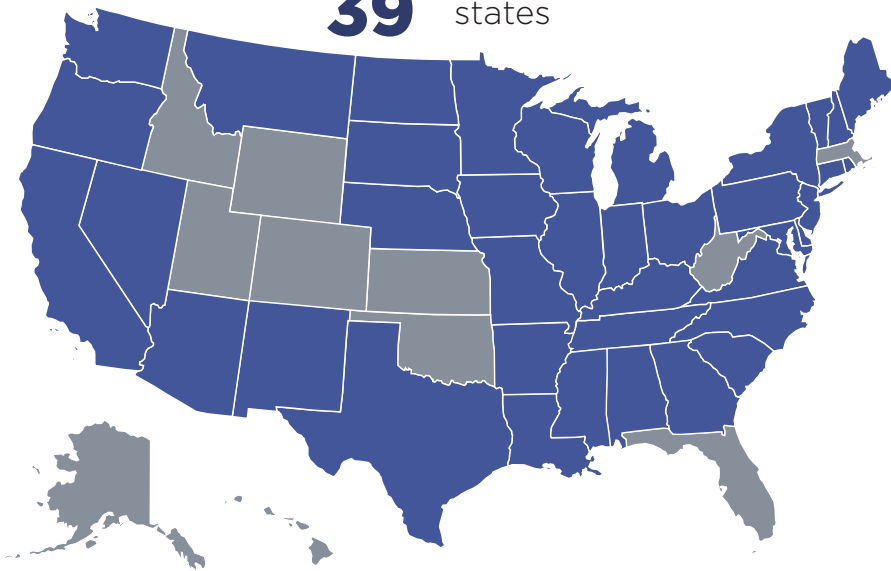


17,451
respondents
118,950
invitees

151 institutions



39 states



13 countries



Figure 1. Faculty study participation overview

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. This research is important for gaining a better understanding of faculty perspectives of technology in relation to teaching and research. Moreover, when combined with the voices of undergraduate students, the 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 incorporate more or better technology into their teaching practices or curriculum, as well as research and scholarship

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, as with the annual ECAR student study, 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 findings supplement what IT professionals already know about faculty technology experiences and can help improve the academic community’s experiences with technology.

This report is one of the most comprehensive pictures of faculty IT experiences EDUCAUSE has produced to date. Any higher education institution can contribute data to this annual project by contacting study@educause.edu. Participating institutions 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

To better understand the landscape of faculty technology experiences in 2014, we will first contextualize the findings from this study with the top IT issues in higher education. EDUCAUSE’s annual Top 10 IT Issues list represents the current challenges and priorities for higher education IT according to EDUCAUSE membership (primarily IT leaders and professionals).¹ In 2014, seven of these IT issues were relevant enough to faculty for ECAR to ask about in this study. Specifically, we asked faculty about the extent to which they agree that their institution is addressing each of these issues. In the case of the #1 issue, improving student outcomes through technology, about two out of three faculty (62%) agreed or strongly agreed that their institution improves student outcomes through technology, the highest level of agreement on any of these seven issues (see figure 2). This finding suggests that institutions do better with some issues than with others. These data show us there is room for improvement across the board and give us baseline measures for IT leaders to gauge progress on the institution’s efficacy of addressing these issues.

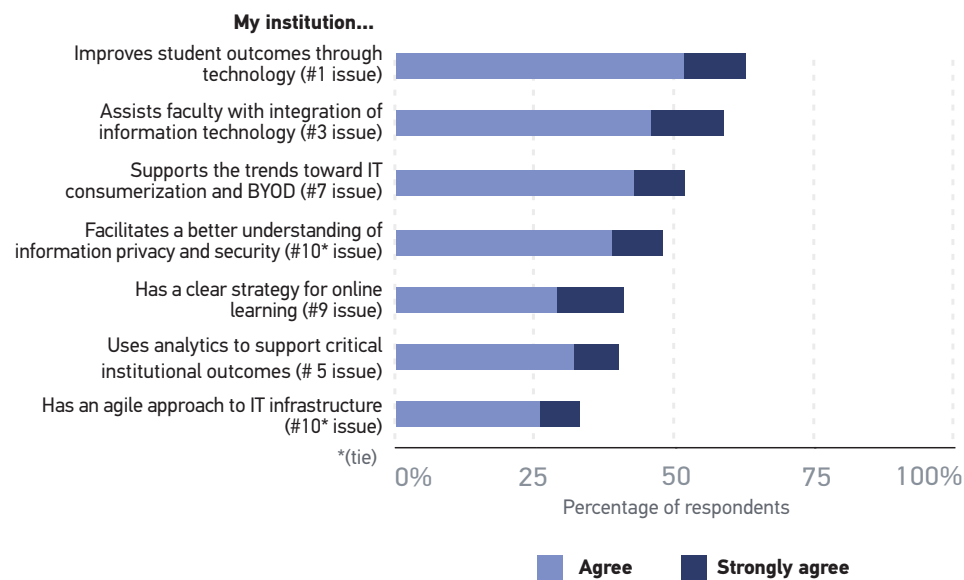


Figure 2. Faculty perspectives on selected top IT issues in 2014

It is also important to consider faculty experiences in the context of their perceptions of students’ preparedness and willingness to use technology for academic purposes. Two out of three faculty (67%) agreed or strongly agreed that most of their students have adequate technology skills. The 2014 student study findings mirror this sentiment, with 67% of students rating themselves as being adequately prepared to use technology when they entered college. We asked faculty to tell us in what areas their

67%

of faculty say students have adequate technology skills, but there are certain areas where faculty think students could be more prepared to use technology:

54%

of faculty say students should be better prepared to use institutionally specific technologies (i.e., the LMS)

47%

of faculty say students should be better prepared to use basic software programs and apps

30%

of faculty say too many students look to them/their TAs for tech support

—ECAR faculty and student studies, 2014

students could be more prepared to use technology. Basic computer literacy and productivity software experience (such as using Word and Excel) were mentioned by 39% of respondents. As one respondent put it, “Students need training sessions for basic Microsoft applications (Word, Excel, PowerPoint). Most of them have only a rudimentary knowledge of these programs.” But, do colleges and universities do enough to set and communicate expectations for the type of literacy they wish students to possess at college entry? One respondent suggested that “Students are sometimes unaware of what will be expected from a tech standpoint, so clearer expectations upon enrollment of both software and hardware use would be helpful.” It is ironic to find that supposedly the most digitally literate college-going generation ever is perceived by faculty to have technology literacy issues when it comes to achieving academic success.

We also 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, pleased versus perturbed, useful versus useless, enhancement versus distraction); and **usage** patterns (e.g., always versus never connected, central versus peripheral, new versus old media, frequent versus infrequent). The resulting scales reveal that faculty are sophisticated and engaged with IT, averaging significantly above the neutral position (50) on the scales. On average, faculty reported high levels of IT use (72), positive attitudes toward IT (70), and positive dispositions toward IT (65) (see figure 3).²

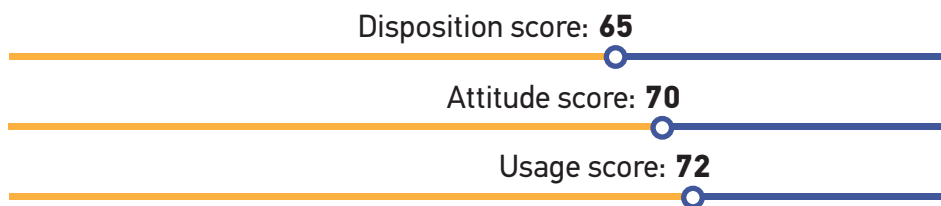


Figure 3. Scaled scores of faculty semantic differential toward technology

Similar to findings from a 2013 *Inside Higher Ed* survey of faculty attitudes about technology, our data reveal a considerable amount of information regarding the current and potential use of information technology in academic settings by faculty.³ Moreover, the data demonstrate that a significant majority of faculty are positive about the value of technology in higher education. Our results sketch a picture of faculty who are knowledgeable about and receptive to the possible uses of technology to enhance teaching practices and learning outcomes. Furthermore, these data suggest that it would behoove IT leaders and decision makers to consult and include faculty when thinking about strategic investments and uses of academic technologies.

The findings for this year's faculty technology study cover new ground to help us tell a more comprehensive story about technology experiences and expectations in higher education. In addition to using faculty perceptions of their own attitudes toward technology and their assessment of the institution's landscape for the current top IT issues in higher education, we connect the results of the faculty study to other resources throughout the report to provide a multidimensional perspective about the meaning and potential impact of the findings. These resources include the EDUCAUSE Core Data Service to give us the institutional perspective, the ELI Content Anchor Survey to give us the teaching and learning community perspective, and ECAR's student technology study to give us the student perspective. Each of these resources helps build context for the story about what matters most to faculty. The nine findings that follow can help IT leaders optimize the impact of IT in higher education in the areas that affect teaching and research faculty.

Online Learning Environments

Faculty recognize that online learning opportunities can promote access to higher education but are more reserved in their expectations for online courses to improve outcomes. Online teaching experience is moderate, and faculty with some online teaching experience have more positive attitudes toward learning that has web-based components, including the potential value of MOOCs to higher education.

Faculty are particularly optimistic that online learning can make higher education available to more students (78%). Enthusiasm about extending access to higher education through online learning opportunities is tempered, however, by general skepticism that online learning will help students learn more effectively (35%) or lead to pedagogical breakthroughs (42%; see figure 4). These findings are not as critical of online learning as the *2013 Inside Higher Ed Survey of Faculty Attitudes about Technology*, which found that only 21% of faculty agreed that online courses can achieve learning outcomes equivalent to those of courses taught in person. Faculty perceptions of the efficacy of online learning were more positive among those who have online teaching experience, with 33% agreeing that online and face-to-face learning outcomes are equivalent.⁴ ECAR findings also show substantial differences in faculty attitudes between those who have recently taught an online course and those who have not.⁵ Almost half (49%) of faculty who have taught in an online environment in the past year agreed or strongly agreed that online environments help students learn more effectively, compared with 29% of faculty with no online teaching experience. Almost two in three faculty (62%) with recent online teaching experience agreed or strongly agreed that online learning will lead to pedagogical breakthroughs, compared with 36% of faculty with no recent online experience. Comparing the three groups of faculty depicted in figure 4 shows expected associations of agreement. More sophisticated approaches, such as regression analyses, do not add anything substantial

35%

of faculty have recent online teaching experience

—ECAR faculty study, 2014

to the conversation. Having a clear institutional strategy for online learning could help improve attitudes about the efficacy of online learning, but this does not appear to be the primary driver when it comes to faculty attitudes about online learning.

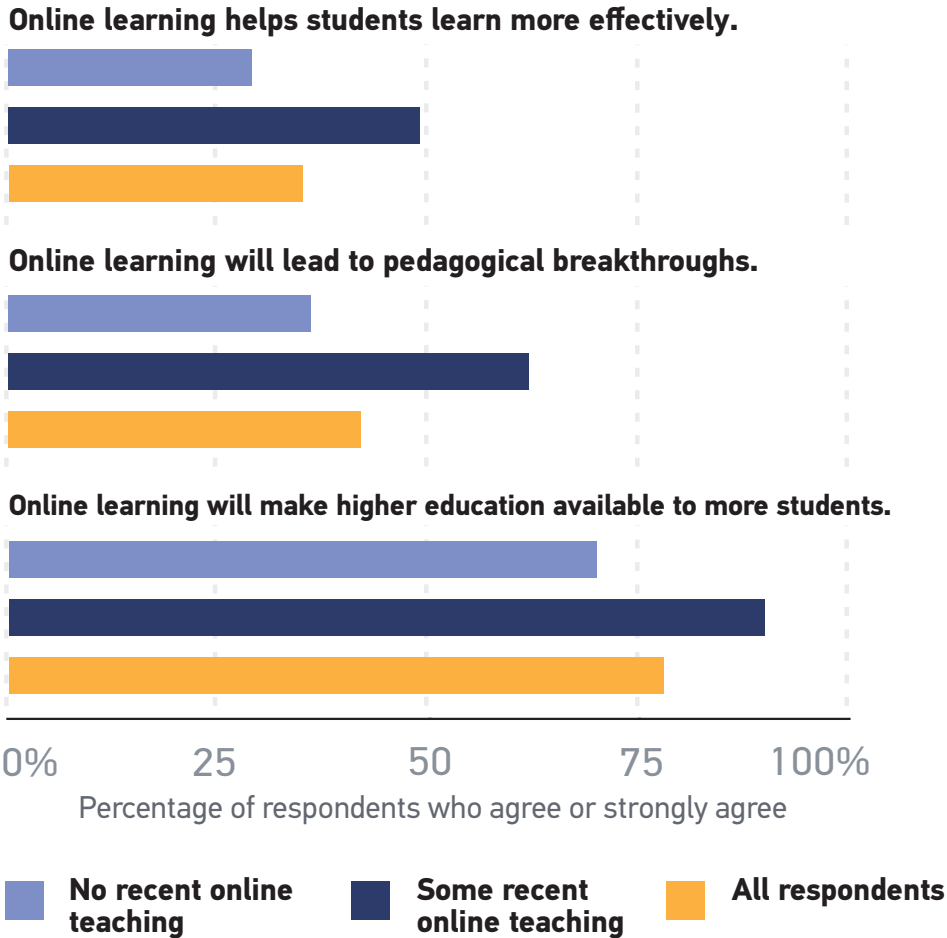


Figure 4. Faculty agreement with statements about online learning, based on online teaching experiences

The 2013 ECAR e-learning study showed that the vast majority of institutions view e-learning as a priority (85%) and an investment (81%).⁶ This sentiment is supported by the #9 IT issue in higher education in 2014: determining the role of online learning and developing a strategy for that role. Most faculty (59%), especially those without recent online teaching experience (73%), do not view their institution as having a clear strategy for online learning. As institutions develop or refine their strategies, IT leaders will need to play a role in developing communication plans to share information about the web-based learning opportunities supported by IT.

Massive open online courses (MOOCs) are a special breed of online learning environments, frequently featuring a highly polished instructional design, elements of interactive and/or adaptive delivery options, a large enrolled learner population (typically around 20,000 individuals), and a low completion rate (on average less than 13%).⁷ About three in four faculty (76%) said they are either conceptually or experientially familiar with MOOCs; compare this to only one in four undergraduates (24%) who say they know what a MOOC is.⁸ Though few faculty reported having actually taught a MOOC, 3% of faculty who taught an online class in the past year said they taught a MOOC. Faculty are much more likely than students to know about MOOCs as an alternative model for online learning.⁹

The more interesting story about MOOCs concerns attitude. Generally speaking, faculty who disagree with the efficacy of online learning are also generally unlikely to see the value proposition of MOOCs in higher education. We asked faculty their perception of the value of MOOCs in higher education and found support for MOOCs varies by institution type (see figure 5). More specifically, faculty in community colleges, private MA, private DR, and non-U.S.-based institutions were more often supportive of MOOCs.¹⁰ Considering that MOOCs purport to embrace the open access model, it is not surprising to find that more community college faculty were generally supportive of MOOCs' value to higher education; likewise, the elite private institutions that embraced the early MOOC experiments seem to be more comfortable with MOOCs as well, as are their faculty. Part-time faculty (53%) expressed more support than full-time faculty (38%); furthermore, non-tenure-track faculty (46%) were more supportive than tenured (34%) or tenure-track (39%) faculty. About two in five faculty (43%) with less than 10 years of teaching experience were supportive, whereas somewhat fewer faculty (37%) with 10 or more years of experience were supportive. Not surprisingly, the picture painted here is that newer (less experienced) faculty have more positive perceptions of MOOCs' adding value to higher education. Pairwise correlations between the value of MOOCs and faculty disposition ($r = 0.2122$), attitude ($r = 0.1704$), and usage ($r = 0.1699$) yielded highly significant and moderately weak positive correlations. We will continue to track these data longitudinally to see whether and how faculty attitudes toward MOOCs change over time.

Who knows what a MOOC is?

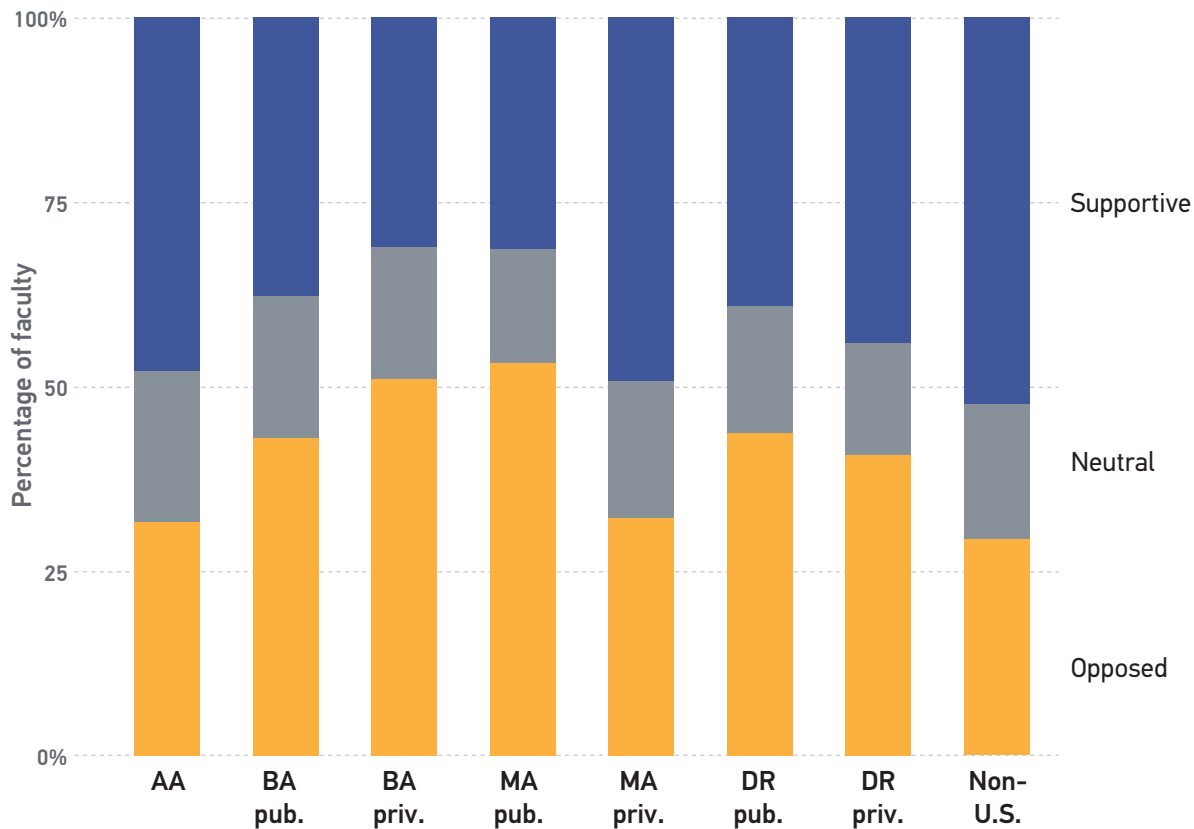
76%

of faculty

24%

of undergrads

—ECAR faculty and student studies, 2014



18% of faculty say they don't know what the value of MOOCs is in higher education.

Figure 5. Faculty perception of MOOCs' value to higher education, by institution type

Student Success Analytics

Faculty interest in early alert systems and intervention notifications is strong. The highest level of interest in learning analytics is in correcting substandard student progress in current coursework.

With the development of integrated planning and advising systems (IPAS),¹¹ it is becoming easier to leverage faculty input about student performance and progress in their coursework to offer early alerts and guidance about how to improve outcomes. An overwhelming majority of faculty respondents have a positive impression of learning analytics systems. Nine in 10 faculty (91%) are at least moderately interested in learning analytics systems offering students interventions about new or different academic resources (such as tutoring and skills-building opportunities) (see figure 6). Eight in 10 faculty are interested in early alerts to students if it appears a student's progress in a course is declining (83%) or intervention suggestions for how to

Most faculty and students have at least moderate interest in early-alert notifications to catalyze academic interventions for substandard academic progress.

83%

of faculty

87%

of undergrads

—ECAR faculty and student studies, 2014

improve performance if a student’s progress is substandard (82%). Fewer faculty—but still a majority—are interested in systems that offer students guidance about courses they may consider taking in the future through suggestions such as “you may also like” or “we recommend” (68%), and automated tracking of students’ course attendance (62%). Preliminary results from the 2014 student study found that 89% of students (up from 76% in 2013) were interested in guidance about course offerings, and 86% (down slightly from 89% in 2013) were interested in early alerts and resource recommendations.¹² Faculty and student interests in the application of analytics to the academic environment are aligned with one another, and many institutions have elements of these systems in place: 47% of institutions have early-alert systems, 69% have academic advising systems, and 76% have education planning/academic progress tracking systems.¹³ As IT leaders make decisions about deploying, improving, or replacing these systems, they can point to strong faculty and student interest in exploring analytics for academics.

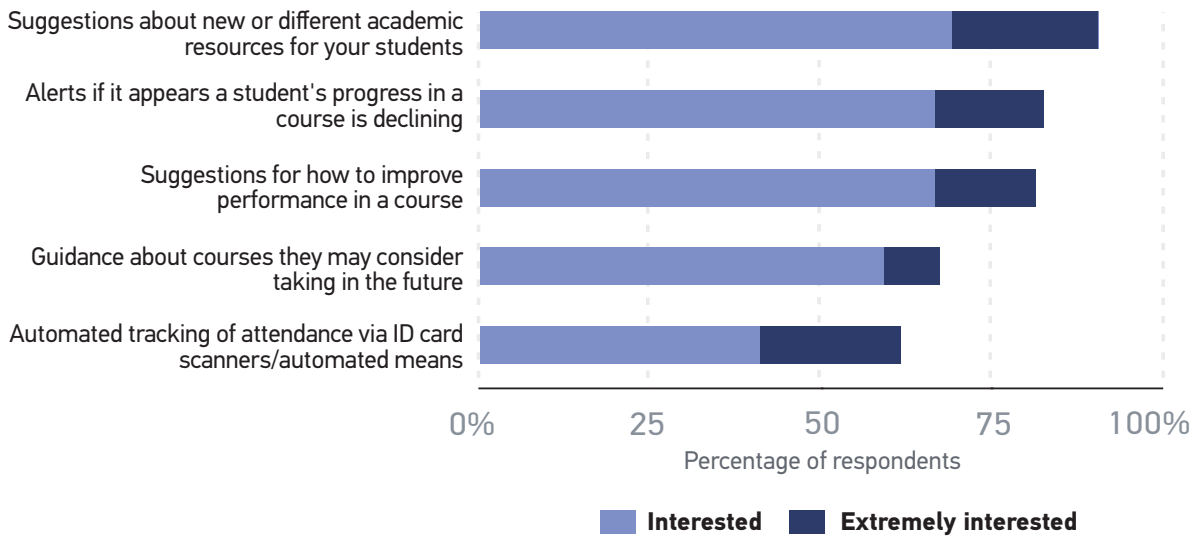


Figure 6. Interest level in early alert and intervention notifications to students

Though the majority of faculty have positive interests in exploring analytics for academics, only two in five (40%) agreed or strongly agreed that the institution uses analytics to support critical institutional outcomes. Faculty at institutions that do apply analytics to support outcomes may not be aware of institutional efforts to apply analytics to business process, or perhaps there is a disconnect between the information generated by analytics and the institutional outcomes. Regardless of the explanation, what we do know from the results of this study is that faculty are more likely to see the practical gains in student success measures as a result of their “in the trench” interventions than because of higher-order gains from the aggregate and cumulative impact of “big data” analytics. Learning analytics that use big data appear to be abstract concepts in higher education, and though many people are talking about it, few really seem to know what “big data” is, much less how to use it.

Learning Management Systems

The majority of faculty are using basic features and functions of LMSs but recognize that these systems have much more potential to enhance teaching and learning. Although satisfied with their general LMS experience, many faculty express interest in being better skilled at integrating the LMS into their courses.

Learning management systems are ubiquitous in higher education and integral to students’ learning experiences. They serve “as the course hub for management and administration, communication and discussion, material creation and storage, and subject mastery assessment.”¹⁴ Among the institutions completing the EDUCAUSE CDS survey in 2013, 99% reported having an LMS in place and, on average, these systems have been in place for at least eight years. We also know from CDS that 93% of institutions use one of the top 5 LMS vendors (see figure 7).¹⁵ Faculty responses to our question about what LMS system they typically use basically mirrored the CDS findings.¹⁶

Among institutions with analytics capabilities

73%

have degree audit/academic progress tracking

66%

have academic advising systems

46%

have early alert systems

—EDUCAUSE Core Data Service, 2013

Student study responses tracked thematically with the faculty study responses, with the exception that substantially more students (89%) than faculty (68%) said they (the students) were interested in guidance about courses to consider taking in the future.

—ECAR student study, 2014

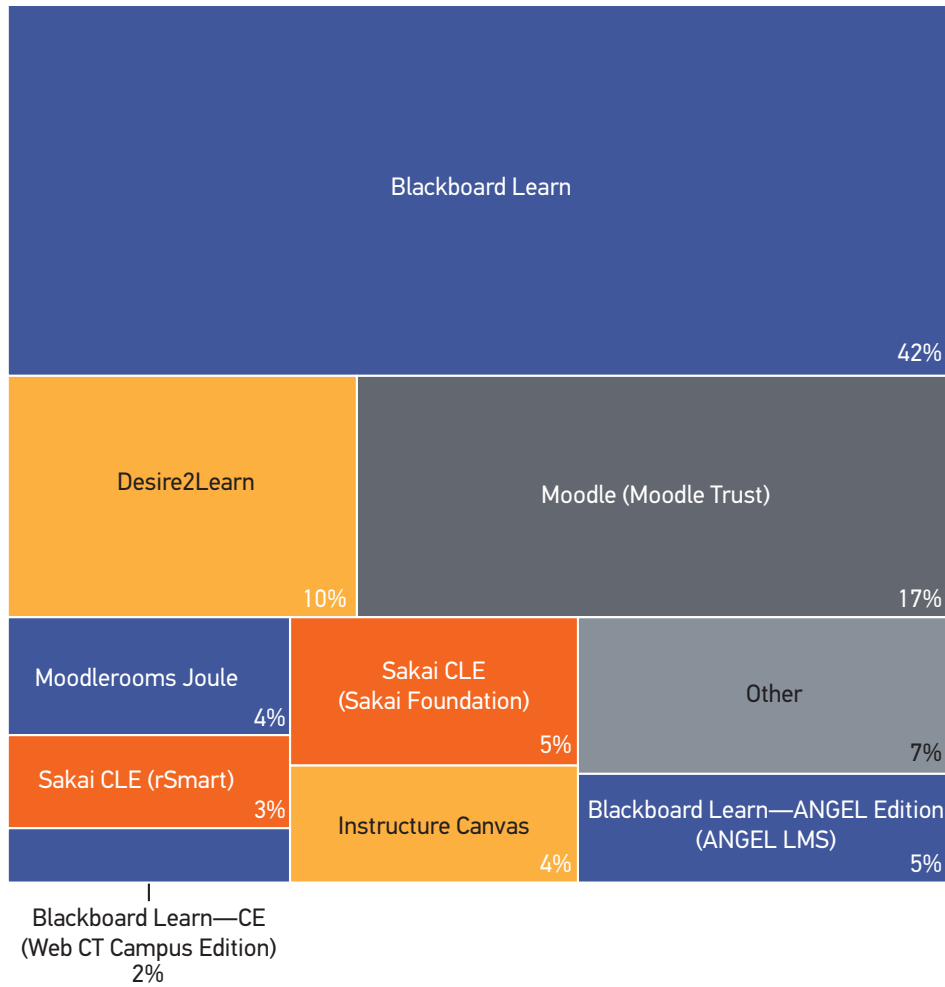


Figure 7. Learning management system market share in 2013¹⁷

Although the LMS is pervasive in higher education, 15% of faculty said that they do not use the LMS at all. Survey demographics suggest these nonusers are part of the more mature faculty ranks, with a tenure status, more than 10 years of teaching experience, and a full-professor standing.¹⁸ The vast majority of faculty use the LMS to conduct or support their teaching activities, but only three in five LMS users (60%) said it is critical to their teaching. The ways in which faculty typically use the LMS are presented in figure 8.¹⁹ Pushing out information such as a syllabus or other handout is the most common use of the LMS (58%), which is a basic functionality of the first-generation systems that emerged in the late 1990s, and it remains one of the core features of any LMS.²⁰ Many institutions preload the LMS with basic course content (58%), up about 12% since 2011, and this base gives instructors a prepopulated platform from which to build their courses.²¹ Preloading basic content does not appear to preclude faculty from making the LMS part of their daily digital habit; a small majority of faculty (56%) reported using the LMS daily, and another 37% use it weekly.

LMS trends include a push for system customization or personalization, “big data” and analytics functionality, systems integration and interoperability, mobile-friendly design, and a balance that lets monolithic systems retain an agile, adaptable nature.

—EDUCAUSE Core Data Service, 2013

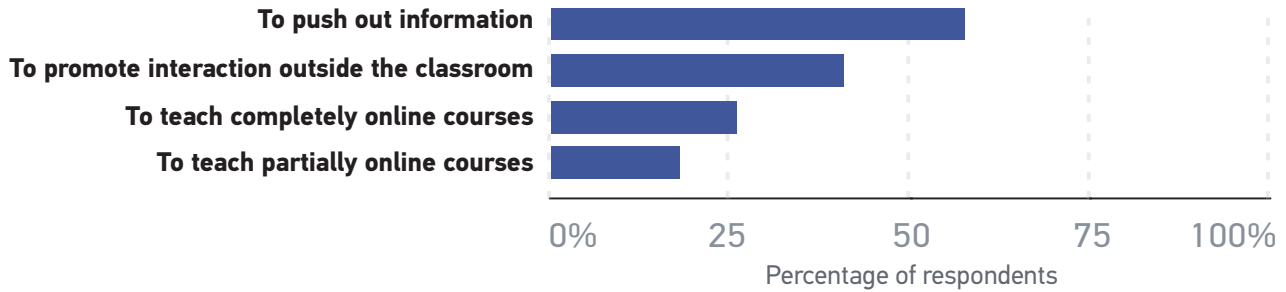


Figure 8. Typical faculty use of learning management systems

Associations between faculty LMS usage and their dispositions and attitudes toward IT and its usage reveal a striking but predictable pattern. Faculty who either do not use the LMS at all or who use it only to push out basic information tend to use IT less and to have negative attitudes and dispositions toward IT. Conversely, those who use the LMS for more sophisticated purposes, such as promoting interaction and teaching partially or completely online, tend to have more positive dispositions and attitudes toward IT and use it more intensely.

Although nearly all institutions have some form of LMS, most faculty are not using it to its full potential. Only 41% of faculty reported using the LMS to promote interaction outside the classroom, and fewer than a quarter use the LMS to teach online courses. Approaching the online learning environment as an ecosystem,²² with the LMS as a prominent resource, would enable more to be done to deepen faculty LMS use through faculty development opportunities, training programs, and examples from peers.

We asked faculty to rate their satisfaction with various features and functionalities of the LMS. Three in five (60%) said they were satisfied or very satisfied with their overall LMS experience. This is appreciably lower than the satisfaction ratings reported in CDS, where 86% of IT departments reported that their faculty generally were satisfied with the functions and features of the LMS.²³ One of the possibilities for the discrepancy stems from the sources of the data: While the faculty study data are an aggregation of individual faculty perspectives, the CDS data were primarily provided by IT leaders. IT leaders may have limited interaction with faculty members and/or those with whom they do interact may be considerably more receptive to using technology for instructional purposes, potentially resulting in a biased perspective. Moreover, faculty who are dissatisfied with their LMS may simply use it less or abandon it altogether without reporting the issues they have with the environment.

To better understand the disconnect between the CDS ratings (provided primarily by IT leaders) and the faculty study ratings (provided by faculty themselves), figures 9 and 10 show satisfaction ratings separately for various functions and features of the LMS, respectively. Figure 9 specifically shows the percentage of faculty satisfied or very satisfied with LMS functionality aspects. Three in four faculty are satisfied

The LMS is a very useful tool ...

... to enhance teaching

74%

... to enhance student learning

71%

—ECAR faculty study, 2014

60%

of faculty say the LMS is critical to their teaching. Rates were notably higher for part-time faculty (69%) and those at AA (65%) and MA (67%) institutions, and faculty who primarily work with graduate students (64%).

—ECAR faculty study, 2014

or very satisfied with system access to the LMS, and somewhat fewer say they are satisfied or very satisfied with system response time (63%) and ease of use (56%). Figure 10 shows satisfaction with various LMS features, with the majority of faculty indicating they are satisfied or very satisfied with LMS constructs for course development and management.

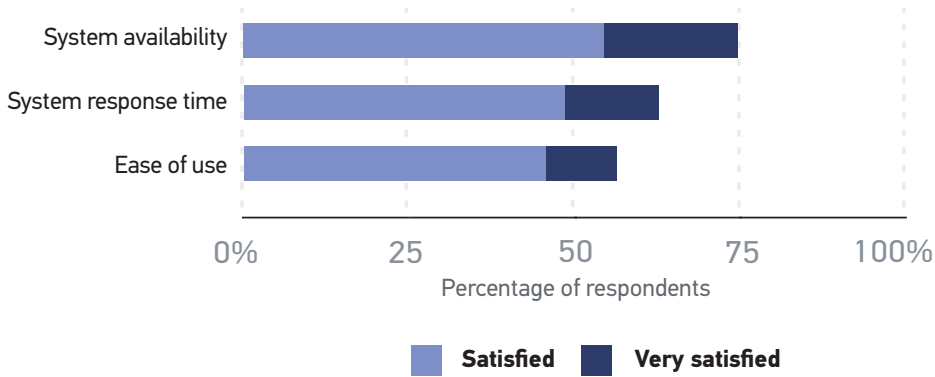


Figure 9. Satisfaction with learning management system functionality

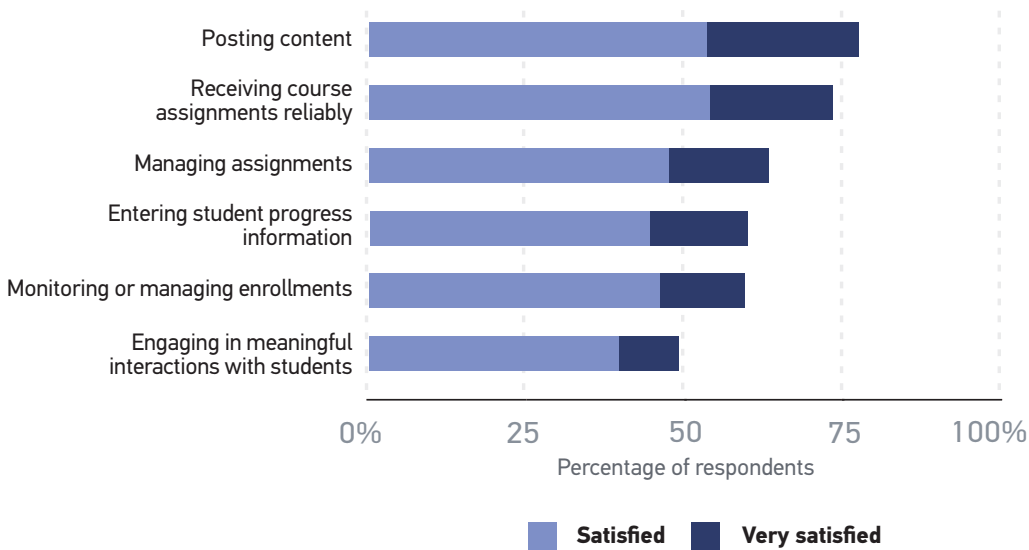


Figure 10. Satisfaction with learning management system features

Engaging students in meaningful interactions (e.g., via discussion boards, direct contact, or social media connections) was lowest on this list of features, with 49% of faculty saying they were satisfied or very satisfied with the LMS's ability to do this. While this result might simply reflect dissatisfaction with the ability or perceived ability of the LMS to actually engage students meaningfully, it could also mean that some faculty don't know how to use these LMS features. Faculty development or more advanced training in the use of the LMS might help increase satisfaction with student engagement in online environments while adding value to the LMS investment.

Though general satisfaction with the LMS was relatively high, the items we asked faculty to rate were all basic LMS features. As previously mentioned, pushing out course content is a core LMS feature, but it is also a basic feature that was included in the first generation of LMSs. "Pushing out content" could range from posting a syllabus to managing access to subject-specific curated content, so it is important to note the diversity in this LMS feature; the significant issue here is that content is unidirectional, moving from the instructor to the students rather than back and forth between instructor and student or among students. George Kroner documents four generations of LMSs in an edutechnica.com post, saying the current iteration of LMSs (LMS 3.0) "will leverage network effects, advanced analytics capabilities, and a seamless user experience across content and devices." While some are already moving in this direction, future-generation LMSs are predicted to have offline capabilities, adaptive pathways, predictive analytics, content subscription and syndication capabilities, seamless mobile experiences, integrated content and learning tools, and the ability to support personal learning networks. The next generation of LMSs will go even further, offering user customization, more feature and communication choices for faculty and students, and open communication protocols.²⁴ Vendors are working toward these goals, and the market forecast for newer, better LMSs is favorable, with 15% of U.S. institutions planning to replace their LMS in the next three years.²⁵ However, our results suggest that many faculty are either struggling to gain proficiency with the suite of LMS tools currently available or have little interest in using them. Certainly, those with a more positive disposition or attitude toward IT may be ready to embrace the next-generation LMS, but much work remains to facilitate the thoughtful and effective use of the LMS beyond the basic dissemination of information.

57%

of faculty agree or strongly agree that they would be more effective instructors if they were better skilled at integrating LMS technology into their courses.

—ECAR faculty study, 2014

To better understand how LMSs are used in higher education and how these systems evolve, we have applied a linear logic model to depict the progression of LMS maturity (see figure 11). Sharing course content and assignments with students fills a basic need for instructors. The LMS is the conduit for sharing content they have created or curated with students and is the academic equivalent of providing students with access to air, food, and water. Building on this base, instructors can use the LMS to organize course materials, facilitate interaction with and among learners, apply analytic technologies, and create self-actualized learning environments for students. The LMS utopia is the personalized and self-actualized learning environment that includes adaptive learning, predictive analytics, seamless mobile experiences, innovation, and natural and prolific engagement. This is where big data is used to re-humanize students in the numeric Boolean sea of ones and zeros where complex algorithms and predictive modeling are applied to digital behaviors rather than individual people. Personalizing the digital learning environment by harnessing the power of learning analytics to treat students as the individuals they are—to a unique learning experience through personalized interactions—is a way to connect and engage with them. Creating meaningful professional development opportunities for faculty and cultivating a culture of ongoing training experiences will be more important than ever as LMSs mature toward self-actualized learning environments.

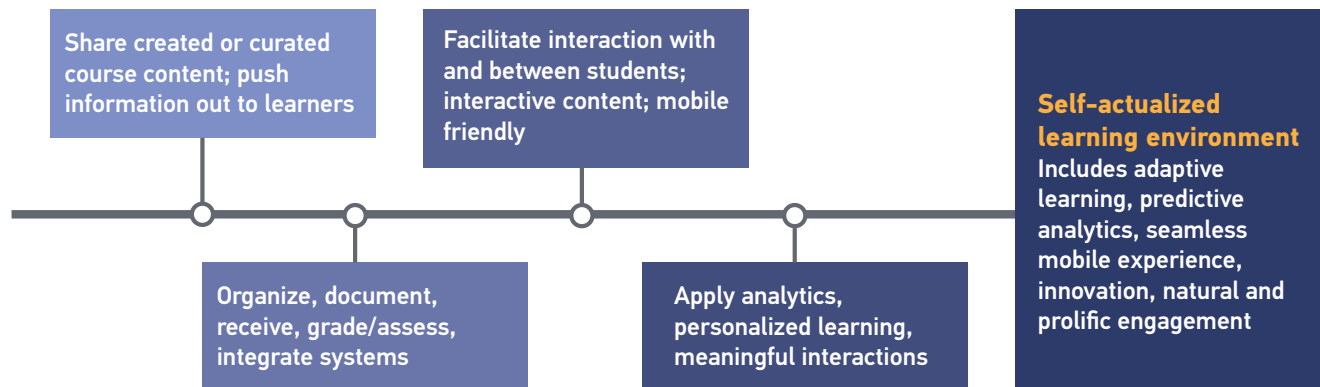


Figure 11. Linear logic model for the evolution of learning management system applications

Fifty-seven percent of faculty said they agreed or strongly agreed that they could be more effective instructors if they were better skilled at integrating LMS technology into their courses. Some types of faculty agreed with this statement at higher rates than other faculty, and understanding which faculty are more amenable to the idea of improving instruction by integrating the LMS into their courses can guide support and training efforts. The summary that follows provides a sense of the general characteristics of faculty who are more predisposed to additional training (although these

data should be interpreted in the context of the needs, interests, and willingness of faculty at specific institutions to benefit from additional LMS training). Among the general characteristics of faculty who reported needing²⁶ more training to integrate the LMS into their courses, they:

- Were female versus male (by 4 percentage points)
- Were nonwhite versus white (by about 7 percentage points)
- Teach in the public administration (70%), health sciences (68%), or education (62%) departments
- Were part-time versus full-time faculty (by 6 percentage points)
- Have less than 10 years of teaching experience (by 4 percentage points)
- Were instructors or lower-ranked/non-tenured professors versus tenured/full professors
- Work with graduate students (by 4 percentage points) and professional students (by 11 percentage points) versus undergraduates
- Had only teaching assignments (by 4 percentage points) versus teaching and research assignments

Suffice it to say that some faculty seem to be more predisposed to LMS support and training, and finding faculty who need more training is a wise use of training and support resources.

Professional Development

Faculty think they could be more effective instructors if they were better skilled at integrating various kinds of technology into their courses. The primary motivation for doing so is improving student outcomes, not influencing direct compensation or tenure decisions.

“Assisting faculty with the instructional integration of information technology” was #3 on the Top 10 IT Issues list for 2014, and it supports the notion that “the integration of technology into higher education is no longer optional, but, rather, is an essential component of a continuum of delivery environments.”²⁷ Faculty recognize that they could be more effective instructors if they were better skilled at integrating various kinds of technology into their courses. Though three in five faculty (59%) agreed or strongly agreed that their institution generally assists them with integration of IT, faculty also recognize the importance of professional development opportunities if they hope to become better skilled at integrating technology into their courses. This sentiment was also expressed in a 2012 faculty study in which about half of the U.S. faculty surveyed strongly agreed that “my institution offers excellent training and support to help me adopt new pedagogies or instructional approaches that take advantage of the opportunities offered by digital technology.”²⁸

Percentage of faculty who are satisfied/very satisfied with their LMS training:

49%

initial training

42%

ongoing training

—ECAR faculty study, 2014

78%

of faculty have a growing interest in incorporating technology into teaching

80%

of faculty have access to IT training resources

—ECAR e-learning study, 2013

For more context, we asked faculty the extent to which they agree that they could be more effective instructors if they were better skilled at integrating specific types of technology into their courses (see figure 12). Topping the list are technologies that can help faculty teach more effectively: free, web-based content such as YouTube or Khan Academy (62%); online collaboration tools such as Google Docs, Adobe Connect, or Blackboard Collaborate (58%); the LMS (57%); and simulations or educational games (57%). With regard to educational gaming, we have found that about half of students (49% in 2013 and 50% in 2014) are interested in their instructors' using simulations or educational games more, and faculty interest in learning how to do this aligns well with this finding. Part-time faculty are slightly more interested in integrating games/simulations (59% vs. 56% of full-time faculty), as are faculty with less than 10 years of teaching experience (61% vs. 52% among those with 10 or more years of experience). Because of their interest, these are the populations to work with to engage in experimental activities with gaming. Faculty at BA, MA, and DR institutions showed the least enthusiasm for educational games/simulations (about 55% each) when compared with AA (62%) and non-U.S.-based institutions (60%).



Figure 12. Professional development interests for integrating technology into courses

Faculty who are primarily focused on teaching activities have stronger interest in all four of these training opportunities when compared with faculty who have at least some focus on research and scholarship. In looking at the top 4 items by years of teaching experience and full-time versus part-time status, a few patterns become evident. Faculty with less than 10 years of experience desire training for each of the top 4 technologies (free web content, online collaboration tools, LMS, and simulations/educational games) more than faculty with 10 or more years of experience. Part-time faculty were also more likely to report training needs for each of the top four items. Using the more receptive populations of faculty (newer and/or part-time) as a testing and training ground for technology-related professional development could create early adopter or technology champions, who could then help encourage and mentor other faculty.

In looking at this same professional development opportunity list by institution type, we find some consistency among institutions and some variation in the technology integration training needs (see figure 13). Free, web-based content occupies the first position in most types of institutions, but this should not be conflated with a desire for the openly licensed, high-quality education materials otherwise known as “open educational resources” (OERs). Instead, this “free content” pertains to *anything* that is available on the web. Regardless of institution type, faculty are interested in how to harness the power of the Internet to become more effective curators of knowledge and information to use in their teaching processes.

Top interest	Free, web-based content	Free, web-based content	Free, web-based content	Free, web-based content	Free, web-based content	Free, web-based content	Online collaboration tools	Free, web-based content
2nd	Simulations or educational games	Simulations or educational games	LMS	Online collaboration tools	Online collaboration tools	LMS	Free, web-based content	E-books or e-textbooks
3rd	Lecture capture/recordings	Online collaboration tools	Simulations or educational games	LMS	Lecture capture/recordings	Online collaboration tools	LMS	Simulations or educational games
	AA	BA pub.	BA priv.	MA pub.	MA priv.	DR pub.	DR priv.	Non-U.S.

Figure 13. Top 3 interests for faculty training to integrate technology into courses, by institution type

We know from EDUCAUSE CDS that nearly all institutions provide faculty the option of individual training in the use of educational technology (98%), group faculty training (95%), and 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%)
- Instructional designers to help faculty develop courses and course materials (82%)
- Designated instructional technology center available to faculty (79%)
- Faculty teaching/excellence centers that provide expertise on technology (72%)
- Assistants available to help faculty use technology (66%)²⁹

Given all of these resources, the question that begs an answer is how to motivate faculty to integrate more or better technology into their teaching practices or curriculum. ECAR asked this very question, and the top motivator for faculty to integrate more or better technology into their teaching practices or curriculum is evidence that doing so would benefit students. They want to see technology work and they want evidence that this is making an impact on student learning (see figures 14 and 15). (Also see the sidebar on Seeking Evidence of Impact, p. 29.) Only one of the top 5 items, “release time to design/redesign my course,” may be related to compensation, but it is more likely related to faculty’s wanting institutions to value the time needed to develop new materials and approaches that integrate IT into their courses. Though there is not a lot of diversity by institution type, figure 15 shows the top 3 motivating factors for faculty to integrate technology into their coursework.

The ONE Thing My Institution Can Do with Technology to Better Facilitate or Support My Role Is...

We asked faculty an open-ended question so that they could share one point of interest, concern, or advice about institutional support for faculty when it comes to technology. The most frequent response was about having more or better-maintained equipment (24%), e.g., assigning faculty their own computers and having abundant and reliable projection units and SMART Boards available in every classroom. The next most common items listed were software and service updates and purchases (16%) and time and resources dedicated for training and development (16%). Faculty are not demanding innovative or disruptive technologies to improve their roles; they have basic technology needs that can be met by improving current equipment, systems, and services.

Faculty want to see technology work, and they want evidence that this is making an impact on student learning.

Tenure-track faculty ranked tenure decisions and professional advancement higher than non-tenure-track faculty as a motivating factor for integrating technology into professional practices, but this item is still ranked eighth on the list.

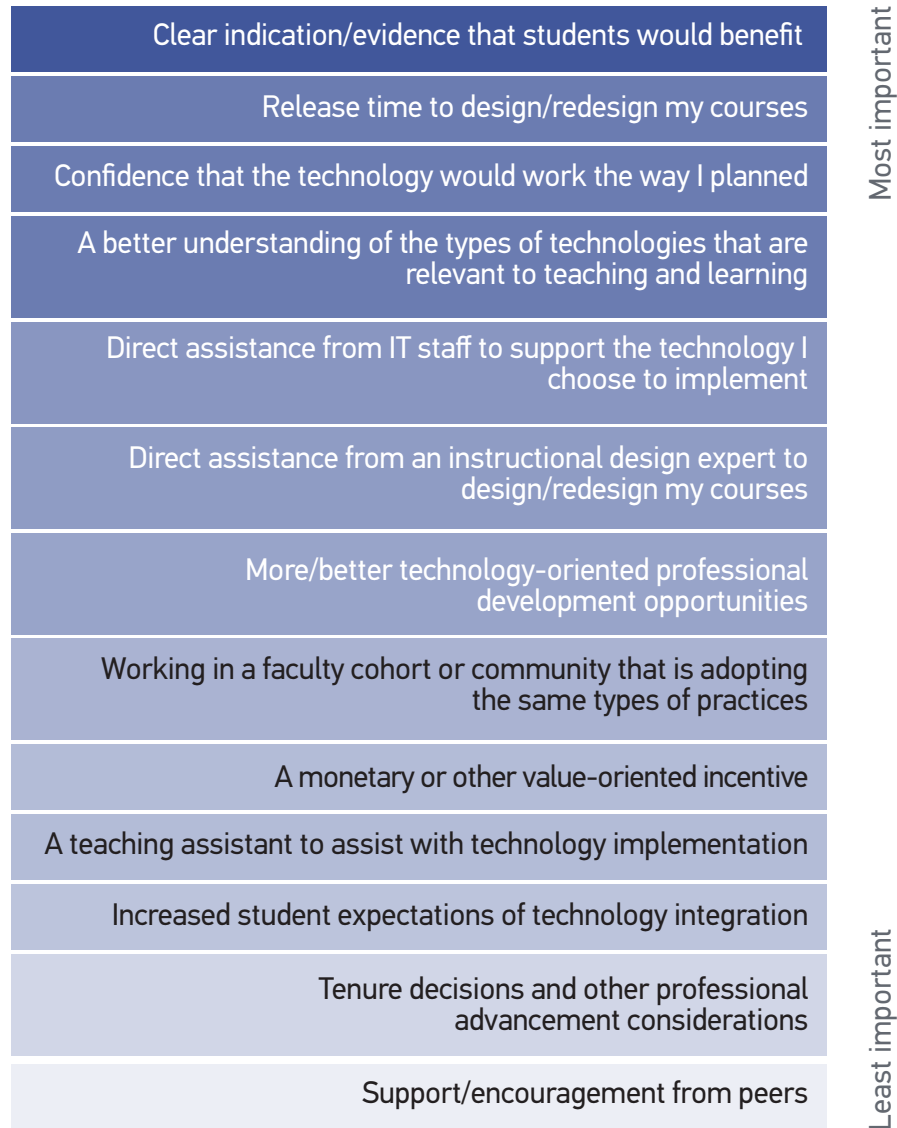


Figure 14. Importance of factors that motivate faculty to integrate technology into teaching and curriculum

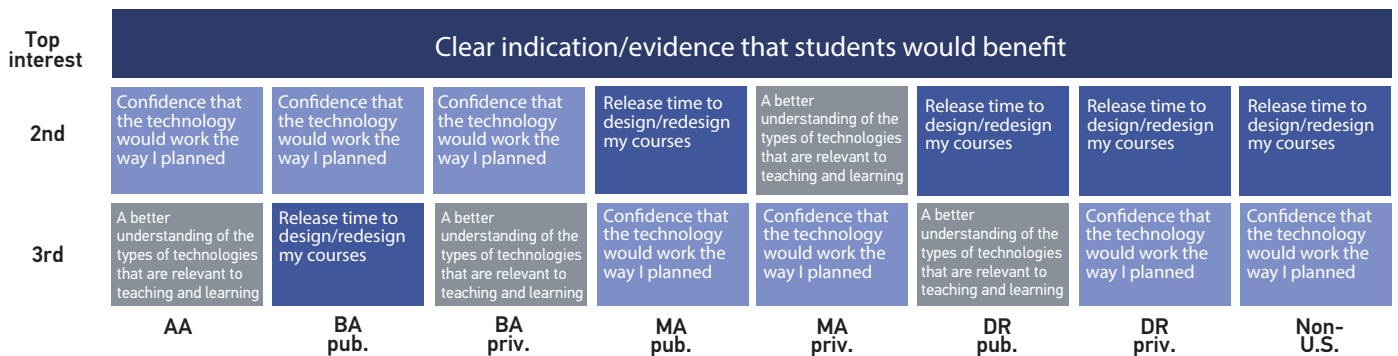


Figure 15. Ranking of factors that motivate faculty to integrate technology into teaching and curriculum, by institution type

Mobile Devices

Faculty recognize that mobile devices have the potential to enhance learning. They also think that balancing academic device use with the potential distractions mobile devices bring to the classroom is a key issue to address in higher education.

Laptop ownership is pervasive (90% in 2014) for undergraduates, and longitudinal ECAR student study data reveal a similar trend in ownership of smartphones (86% in 2014, up from 76% in 2013) and tablets (47% in 2014, up from 31% in 2013).³⁰ Higher education is preparing for the new and continued proliferation of Internet-capable mobile devices on campuses with robust, yet nimble, improvements to the IT architecture and mobile-friendly services, applications, and websites that support the BYOE (bring your own everything) trend.³¹ We learned from the 2013 student study that undergraduates want to use their laptops, tablets, and smartphones in class, yet they told us they were often prevented or discouraged from doing this. The 2014 faculty survey corroborates this experience, with roughly half (51%) of faculty saying they ban or discourage smartphones and 18% saying they ban or discourage tablets (see figure 16). Faculty are less opposed to laptop use in class, but still only a minority of faculty (38%) encourage or require their use. One respondent noted that in terms of professional development and faculty training needs, faculty want “more courses to show us how to bring technology into the classroom. I’d like a course to utilize their addiction to their smartphones rather than banning the smartphone from the classroom.” This quote suggests faculty may be more willing to use these devices in their courses, but many don’t know where to start or what exactly to do to harness the power of the smartphone or tablet so as to avoid the student disengagement or zombification that they fear will occur with the use of such devices.

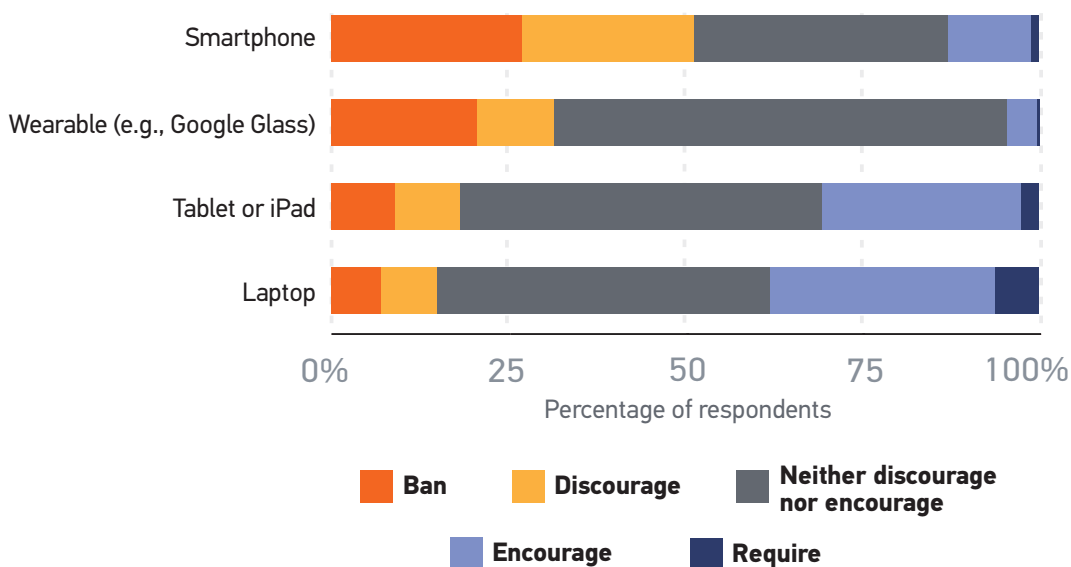


Figure 16. In-class BYOD policies and practices

In looking at the overlaps, we find that almost all faculty who ban or discourage tablets also ban or discourage smartphones. Laptop and tablet policies are also very closely tied to one another, with 84% reporting the same in-class policy for both. Fifty-three percent of faculty report stricter smartphone policies than laptop policies, with 46% having the same policy for both.

Faculty’s main concern about in-class use of mobile technology is that it is distracting (67%). One respondent said, “Using smartphones or tablets would be great if the use could be controlled.” The notion of keeping students’ attention (and keeping control of the classroom) was a recurring theme in the open-ended question responses. Students are somewhat less concerned about the distraction of mobile devices, with 47% of U.S.-based undergraduate students agreeing that in-class use of mobile devices is distracting. Yet we also know from the ECAR student study research that students have practical intentions for their smartphones and tablets in class: for example, to look up information, capture static images of in-class activities or resources, participate in interactive class activities, and record lectures or other in-class activities. Though we did not find overwhelming enthusiasm among students for using mobile devices in these ways (see figure 17), that may be because few faculty encourage or require these devices in class and few faculty (30%) said they currently create assignments that take advantage of mobile technologies.

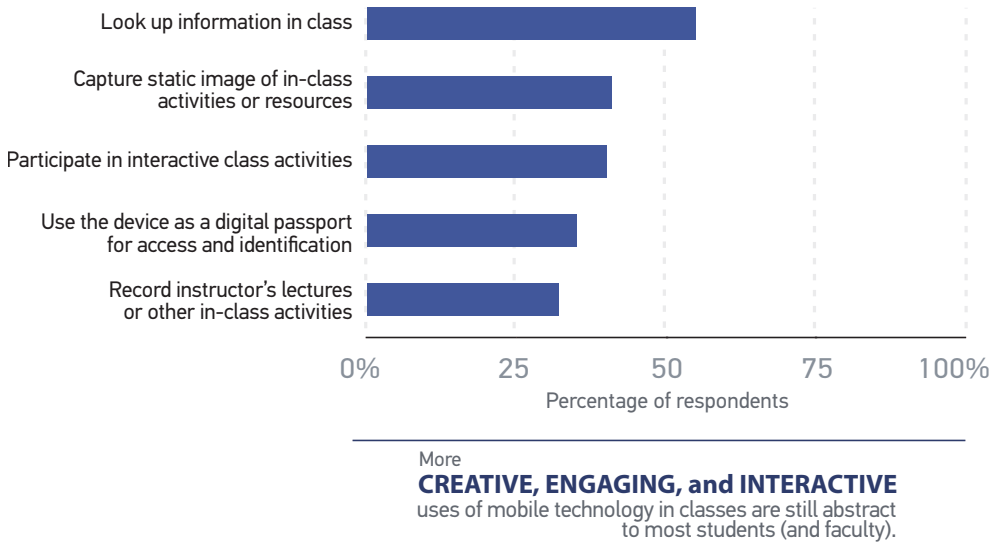


Figure 17. How students would use mobile devices in classes³²

Percentage of students saying they use their devices in class for class-related purposes ...

70%

laptops

35%

tablets

59%

smartphones

—ECAR student study, 2014

Percentage of faculty saying they could be more effective instructors if they were better skilled at integrating students’ ...

45%

laptops

45%

tablets

34%

smartphones

...into courses

—ECAR faculty study, 2014

Smartphones in Class ... or Not?

Considering that today's smartphones are less about being used as telephones and more about being used as microcomputers, it is especially interesting to note the different policies for in-class device use. Laptops are still the most functional devices when it comes to general productivity of students, but smartphones are the mobile proxies for these when students are on the go. Faculty need to consider the appropriateness of device discrimination when it comes to in-class use. Banning smartphones because there isn't a practical application in a particular class is one thing, but banning smartphones because they are handheld mobile devices is another thing.

In an open-ended question about mobile devices and faculty training needs, we found several variations of faculty responses about needing to better understand exactly what mobile technologies are available and how they are being used successfully in other classes. This suggests very basic "training" needs for some faculty, starting with information about what the options are for integrating mobile technologies into their classes. Many simply do not know what they do not know at this point. Starting with an introduction of what mobile technologies are available, the extent to which these technologies are available, and good examples of how these technologies are being used is an excellent first step in demystifying the utility and application of mobile devices in class. Revisiting figure 17, we can see that the practical application of mobile devices to the student experience is still somewhat rudimentary. More creative, engaging, and interactive uses are still abstract to most students (and faculty), so cultivating scenarios where they can experiment with these devices could help faculty discover new ways of incorporating mobile devices into teaching and learning.



The EDUCAUSE Learning Initiative has a "Seeking Evidence of Impact" program that supports practices that enable institutions to measure impacts, produce data, and provide a richer, evidence-based picture of innovative teaching and learning programs. For more information visit <http://www.educause.edu/eli/programs/seeking-evidence-impact>.

54%

of faculty say they'd like more training on incorporating mobile devices into their courses.

Part-time faculty and faculty with less teaching experience were slightly more inclined than faculty with more teaching experience to be open to more training activities.

59%

of part-time faculty,

55%

of faculty with up to two years of experience, and

52%

of faculty with 10–20 years of experience say they want more mobile device integration training.

—ECAR faculty study, 2014

On a positive note, it is heartening to find that a little more than half of faculty (54%) agreed that in-class use of mobile devices can enhance learning (see figure 18).³³ Another 26% of faculty are neutral about the use of mobile devices in class enhancing learning, which leaves only 20% opposed to the idea. This could be a promising indicator that the academy is on the cusp of finding the balance point between the risk of distraction and the benefits of mobile devices as (teaching and) learning tools. One respondent put it well by saying, “We don’t know what you do with the technology in the classroom, but what we do know is that its presence makes it possible to have a backchannel of conversation that you couldn’t have otherwise had.” Moreover, we think some faculty would welcome the use of mobile devices in the classroom if they knew how to better incorporate them into their courses, as evidenced by the following respondent quote: “Training on integrating students’ phones or laptops into teaching would be useful.” Despite the disconnect between the pervasiveness of mobile device ownership and faculty use of these devices as active learning tools, we know from the ECAR student study that students are enthusiastic about having the opportunity to integrate their personally owned devices into the classroom environment.

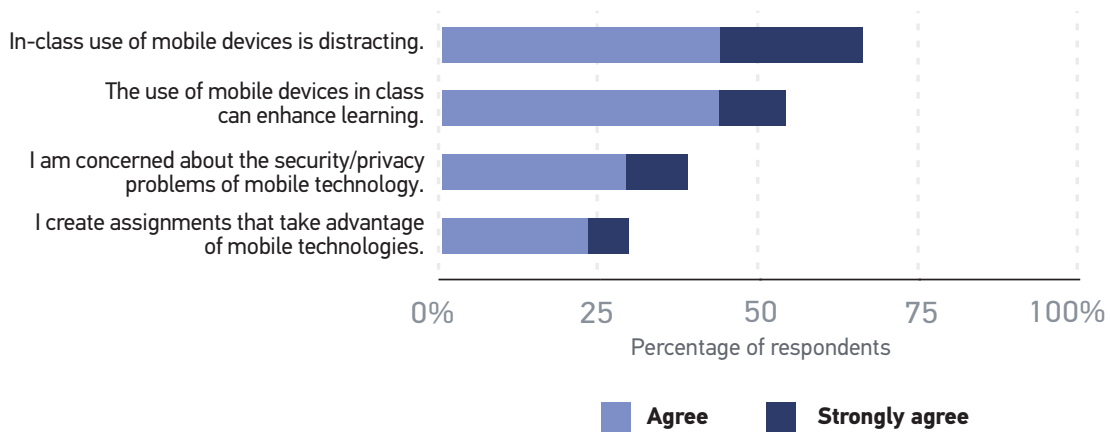


Figure 18. Faculty views about in-class use of mobile technology

The theme of BYOE (bring your own everything) is interwoven into the fabric of many of the Top 10 IT Issues for 2014; its having gone from a stand-alone item to an underlying theme this year is evidence that this issue has reached an apex of influence in higher education. It is imperative that institutions support the trends toward IT consumerization and the bring-your-own-technology era, and about half of faculty agreed or strongly agreed (52%) that their institution already does this. We asked faculty an open-ended question about the technology that has the greatest potential to positively impact their faculty role, and the most frequent response (24% of respondents) referenced mobile devices. These responses included comments about using their own mobile devices in their teaching and research as well as student use of mobile devices. Here is a respondent's comment that illustrates the former: "The increased speed and processing power of mobile devices, and their ability to interface wirelessly (either with Bluetooth or Wi-Fi) with projectors, thereby de-tethering me from the podium (allowing me to be more mobile)." ECAR will further explore teaching and learning applications of mobile technologies in future survey work.

The Faculty Tech Detractor—Fact and Fiction

Looking again at figure 3 (or skipping forward to the figures in appendix B), we see that faculty self-assess their technology disposition, attitude, and usage practices on the positive side of the semantic spectrum. When faculty rated themselves on a 100-point semantic differential scale, the mean scaled scores favored positive perceptions about their personal technology usage (72), attitude (70), and disposition (65). When we look at these semantic differential ratings by the survey question about in-class policies for using mobile devices, we find highly significant ($p < .0001$) but moderate (around 0.2) pairwise correlations between each scale and the technology evaluated. Faculty don't see themselves as technology detractors, but faculty who are less open to technology are the ones who more often ban or discourage the use of mobile technology in class. Conversely, faculty who are more open to technology are the ones who more often encourage or require the use of mobile technology in class. Faculty attitudes about technology run the gamut, and the way faculty conduct their classes tends to reflect their attitudes.

Technology in Faculty Work Spaces

Faculty are more pleased with the technology resources used in personal work spaces than with the technology resources used in (or to create) collaborative work spaces. When it comes to classroom-based technologies, the greatest levels of satisfaction are with basic classroom technologies such as projection systems and wireless access. The lowest levels of satisfaction are with refreshing hardware and software in the classroom.

Productivity Resources

Faculty are generally pleased (providing ratings of good or excellent) with the quality of their experiences with technology resources in work spaces such as classrooms (69%), labs (64%), and off-site locations, such as home or traveling for work scenarios (71%; see figure 19). These percentages exceed the satisfaction ratings for physical collaborative spaces (i.e., computer and research labs, 55%) and virtual or online collaborative spaces (i.e., synchronous or asynchronous work with students or colleagues, 57%).

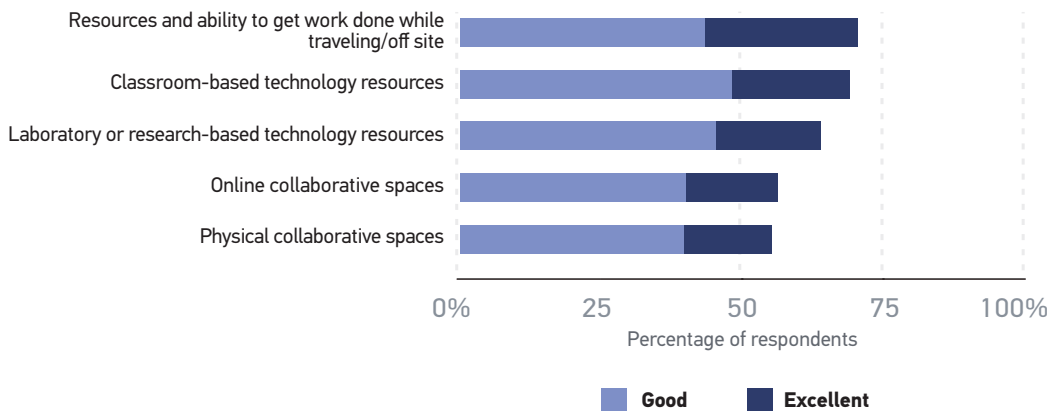


Figure 19. Faculty ratings of their experiences with technology resources teaching/working spaces

Wi-Fi and Communication Resources

According to the Core Data Service, 88% of classrooms, 78% of research facilities, and 78% of administrative buildings in most areas have Wi-Fi.³⁴ Open spaces (outdoors) still lack robust Wi-Fi coverage, with only about one in five institutions (18%) having Wi-Fi coverage of at least 76% of the open space.³⁵ The majority of faculty (72%) also gave good or excellent ratings to communication technologies such as e-mail, instant messaging, and web-based conference technologies. The area in which institutions have the most opportunity to grow is with online or virtual technologies (e.g., network or cloud-based file storage systems, web portals, etc.; see figure 20). Only a small majority (54%) rated their institutions good or excellent for network or cloud-based file storage systems, web portals, and other online or virtual connection mechanisms. Twenty-seven percent of faculty rated institutions poor or fair in this area.

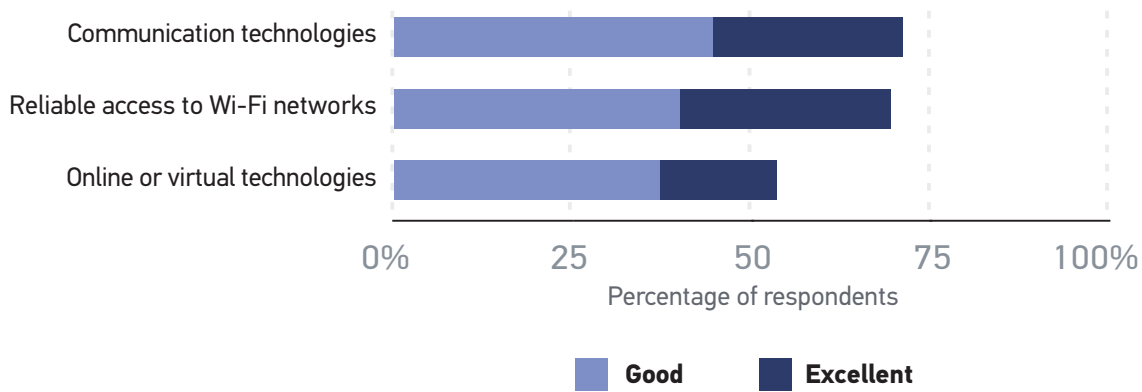


Figure 20. Faculty ratings of their experiences with technology-enabled connection and communication resources

Classroom Technology Resources

In the vast majority of colleges and universities (89%), central IT is responsible for providing educational technology services that include classroom learning space support.³⁶ Nearly 7 in 10 faculty (69%) rated their experiences with classroom-based technology resources as good or excellent, yet when asked later to rate their overall satisfaction with classroom technologies, only 30% of respondents said they were satisfied or very satisfied. Relatively high specific experience and relatively low general satisfaction ratings for classroom technology is a curious combination.³⁷ Perhaps this means that faculty think classroom technology experiences are pretty good but also think they could be better. Another possibility is that faculty experience a variety of physical teaching spaces with a variety of technologies, and that the excellence ratings reflect the high end of their experiences while the satisfaction ratings represent an integrated overall view. In spite of the low overall satisfaction rating, figure 21 shows that faculty commonly said they were satisfied or very satisfied with specific classroom technologies.

89%

of institutions offer classroom learning space support through central IT.

—EDUCAUSE Core Data Service, 2013

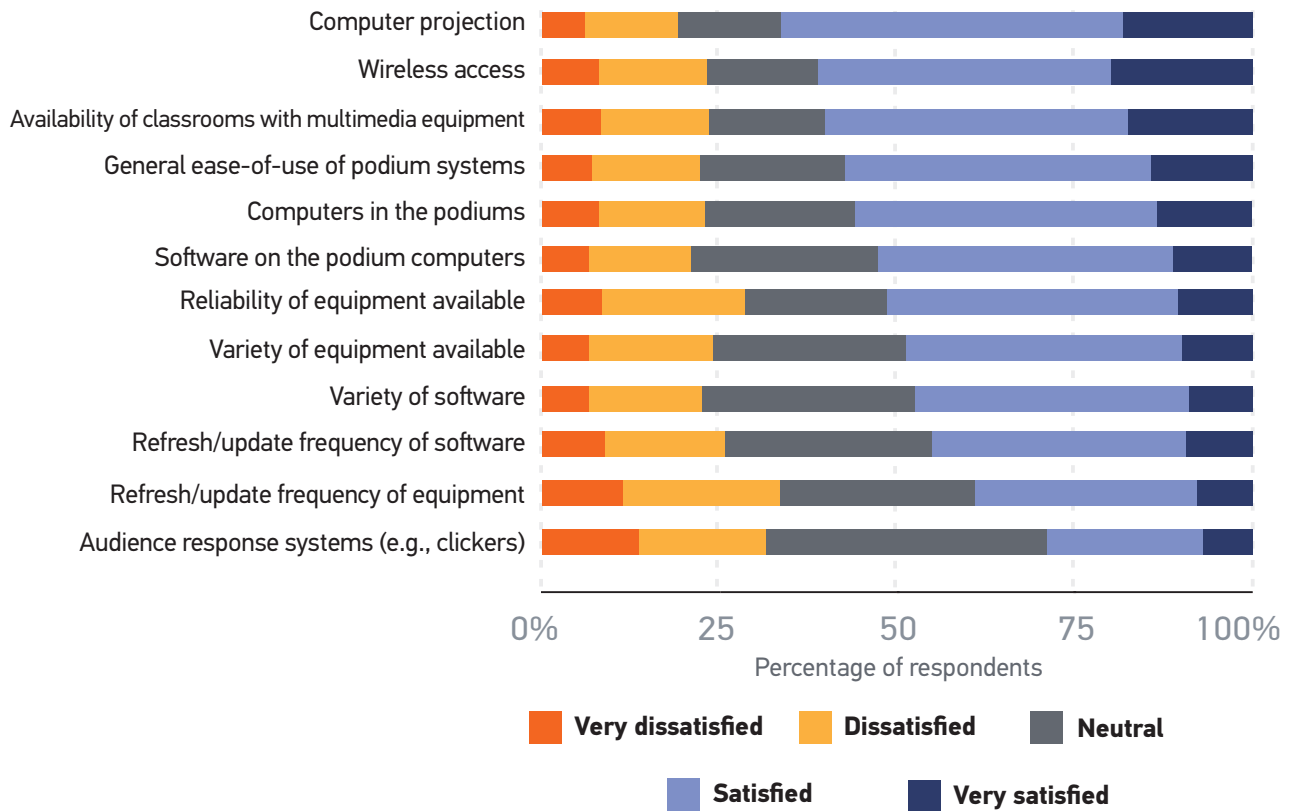


Figure 21. Faculty satisfaction ratings for classroom technologies

Taking a close look at faculty satisfaction ratings, we see that basic technology needs are being met for classroom use/application, with the majority reporting they are satisfied or very satisfied with resources such as projection units, Wi-Fi, multimedia equipment, and podiums. Fewer were satisfied with resources that relate to variety and contemporariness (refreshes/updates). Institutions looking to improve classroom technology experiences should note the three items with the lowest ratings: refresh/update frequency of equipment (33% dissatisfied/very dissatisfied), audience response systems (31%), and reliability of equipment (29%). Though audience response systems are somewhat of a boutique addition to classroom technologies, equipment refresh and reliability of equipment have basic standards that all faculty should expect institutions to observe. “Is the equipment up to date?” and “Will it work?” are not questions you want your faculty to ask, and building confidence among faculty in this area can go a long way toward improving the image of campus technology and the willingness of faculty to incorporate it into their lessons (refer back to figure 14).³⁸

Technology Support

The majority of faculty rely on the institution’s help desk for technology support. Help desk service satisfaction ratings were high for most modalities of service and highest for phone, walk-in, and e-mail.

Looking at CDS data, we get a better picture of the campus support of technology services for teaching and learning (see figure 22). On most campuses, central IT or another administrative or academic unit currently provides a robust variety of technology support services, a finding that extends across Carnegie classes for most technology support activities. Though these data do not directly connect with the ratings of individual technologies displayed in the preceding figure, they are indicative that technology support for faculty is imbedded in the landscape of higher education. Raising awareness of technology support opportunities may help close any gaps that exist between faculty support needs and institutional support offerings; if nothing else it could catalyze dialogue between faculty and instructional technology support professionals.

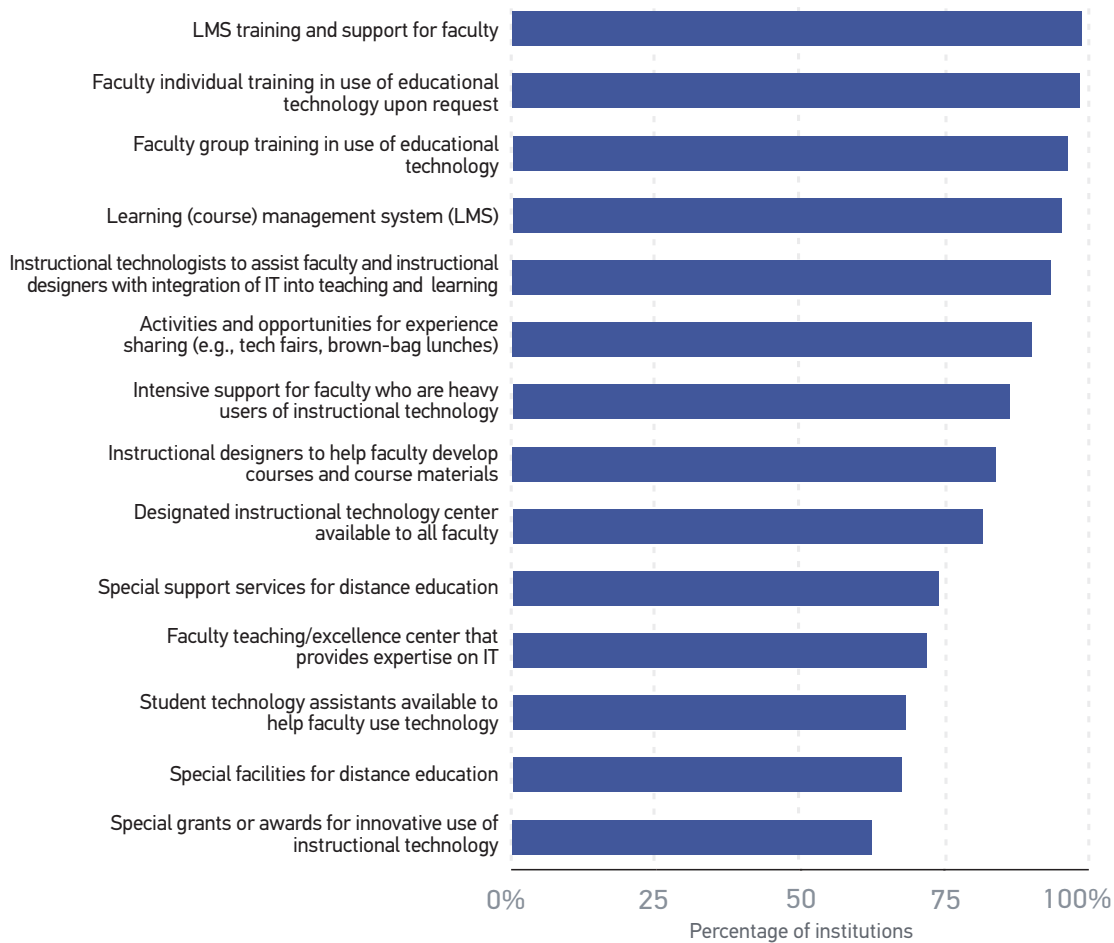


Figure 22. Percentage of institutions providing various IT support and training services to faculty³⁹

The majority of faculty (73%) look to the college or university help desk services for technology support and assistance, followed by the crowd-sourced “Hey, Joe!” approach of asking peers or colleagues (57%) and the do-it-yourself method of just Googling solutions (45%; figure 23). Common write-in items included looking to one’s department, the faculty teaching/excellence center, instructional design staff, and instructional technologists.

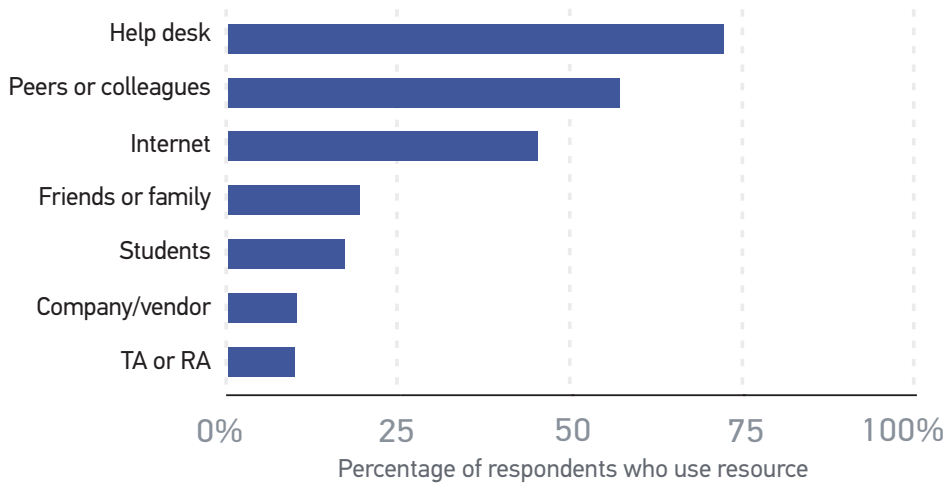


Figure 23. To whom do faculty look for technology support?

Among faculty who said they use the college or university help desk for technology-related support activities, four in five (79%) rated their overall experience as good or excellent. The highest specific-service percentages of good/excellent ratings went to phone, walk-in, and e-mail (77%–74%; see figure 24). Phone, walk-in, and e-mail help desk services also happen to be the most frequently offered modes for delivering help desk services, according to both CDS (for all users) and the number of faculty ratings in this study, with phone calls topping the list. Self-service FAQs also drew a respectable percentage of responses, indicating that many faculty pursue that avenue; however, this area was rated favorably only 41% of the time.

79%

of faculty who use the help desk had a good or excellent experience.

—ECAR faculty study, 2014

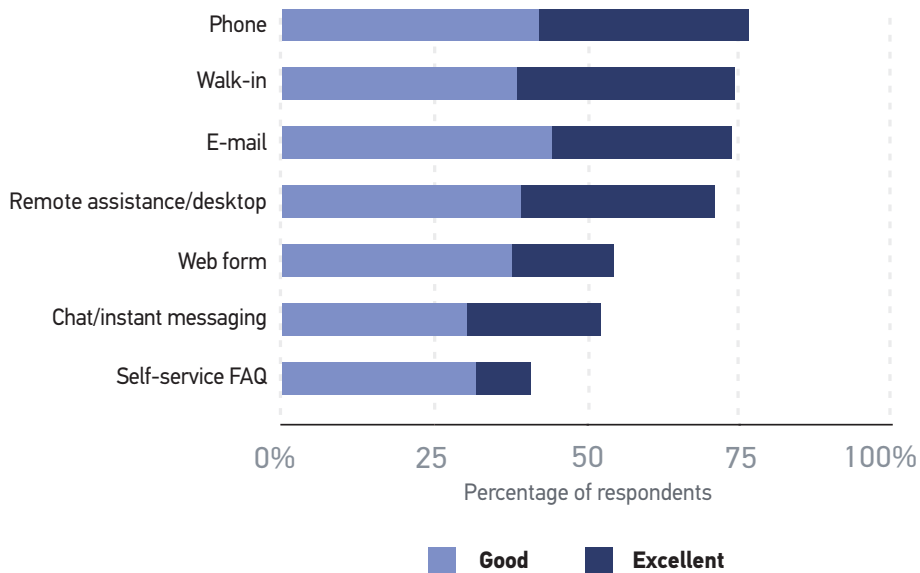


Figure 24. Faculty ratings of their experiences with various modalities of help desk assistance

Security and Privacy Issues

Most faculty are confident about their ability and actions to keep student and scholarly data secure. However, only about half of faculty have confidence in the institution to safeguard data and information.

We asked faculty about their attitudes and experiences with security and data privacy issues. They rated their own habits, (e.g., “I take sufficient measures to keep data about my students secure”) higher than institutional practices as they perceived them (e.g., “I think my institution’s privacy and security policies impede productivity”). Figure 25 shows the percentages of faculty who agreed or strongly agreed with various statements about security and data privacy. Most faculty are confident in their ability to take sufficient measures to keep student data secure (88%) and research and scholarly data secure (76%), but not nearly as many agreed or strongly agreed that the institution will safeguard their personal information (53%). Similarly, only about half of faculty (51%) feel they have access to resources to keep data secure and that their institution “facilitates a better understanding” of information privacy and security (48%). We know from the recent ECAR study on governance, risk, and compliance that “most institutions employ some means of addressing enterprise (95%) and IT risk management (96%) issues.”⁴⁰ The gap between the practices of individuals to employ risk-mitigating activities and faculty perceptions of institutional data security (see figure 25) suggests that a couple of things might be at work here: IT may not be effectively communicating their efforts to protect data and mitigate risk, and/or recent highly publicized data breaches are compromising faculty confidence in data security.

Percentage of institutions offering various modes of help desk services:

100%

phone

97%

e-mail

96%

walk-in

77%

web form

71%

remote desktop

59%

self-service, FAQ

38%

chat/IM

27%

social media

8%

text message

—EDUCAUSE Core Data Service, 2013

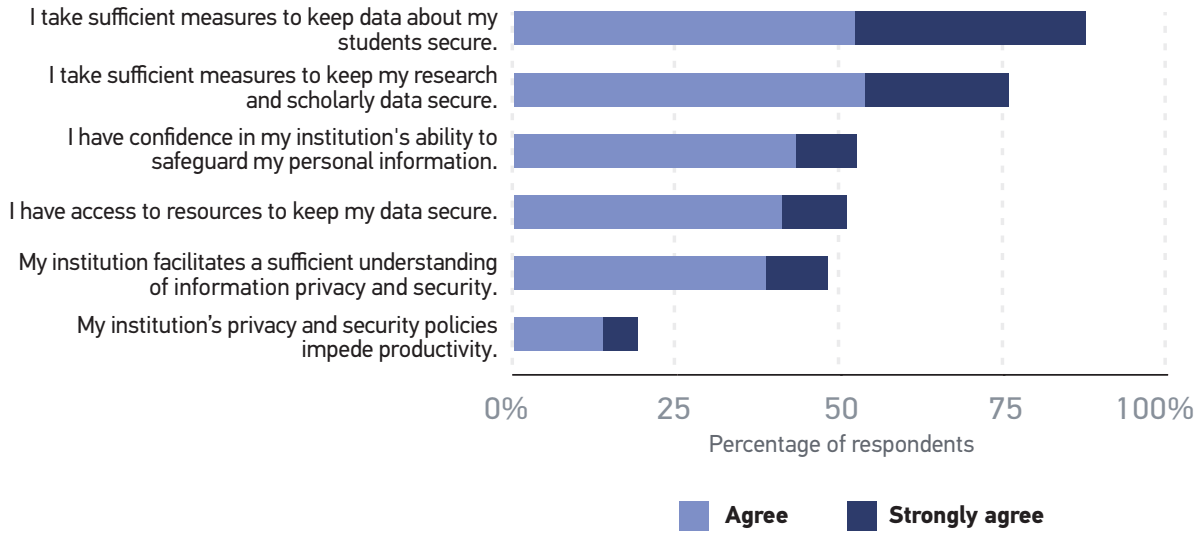


Figure 25. Faculty perspectives on data and information privacy and security

Research Faculty

Research faculty reported positive experiences with bandwidth and data storage, but ratings were generally lower for other types of research support. Some of the concerns point to gaps in general university processes and procedures, whereas other concerns are directly related to faculty experiences for specific IT support.

Faculty who indicated they conduct research were asked about the institution's IT support for their research activities. Forty-two percent of these faculty agreed that IT support for their research activities is adequate. Faculty were most pleased with access to specialized research software and hardware as well as adequate, timely, and appropriate support for IT (see figure 26). Faculty were least pleased with IT support for text analysis, technology support for promotion and tenure, and effective software for grant applications and management.

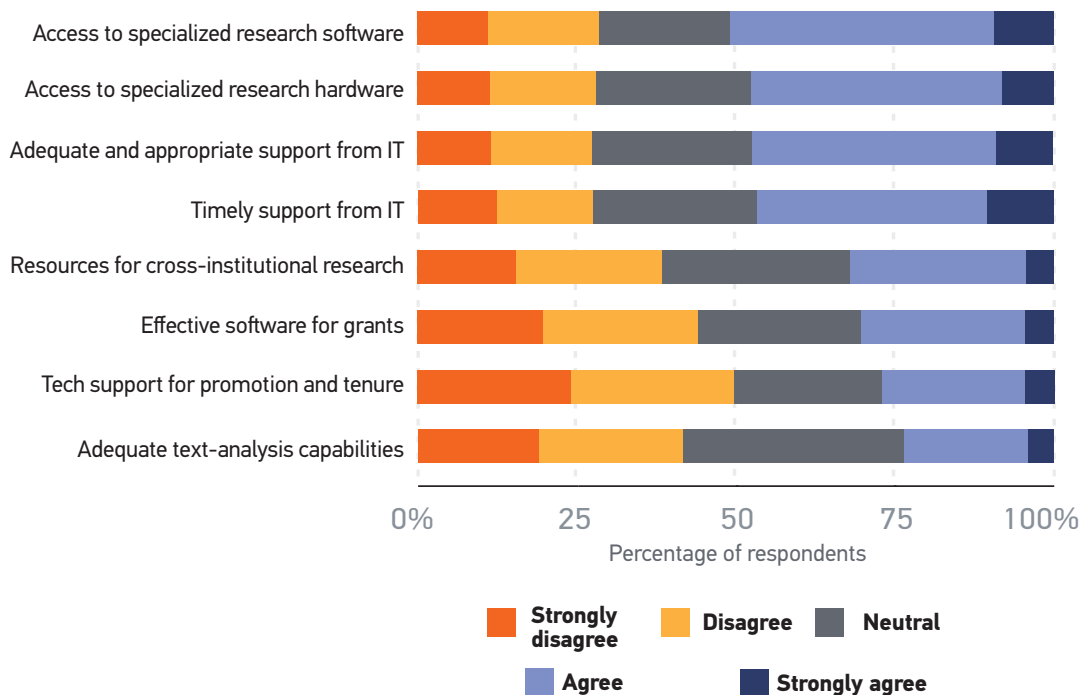


Figure 26. Faculty agreement about the adequacy of support for research and scholarship activities

Higher education IT leaders gathered at the 2014 ECAR Annual Meeting to explore research computing in higher education. Their seven concluding recommendations centered on the notion that institutions need to develop a nuanced and integrated strategy for e-science:

- Central IT needs to define its role in supporting research.
- Central IT can play a role as an aggregator of demand for cybercomputing.
- IT organizations should focus on building blocks and tools.
- Institutions need to recognize research computing’s impact on the humanities and other disciplines not traditionally associated with high-performance research computing.
- Institutions need to develop a data management strategy for the life cycle of data.
- IT organizations should help faculty collaborate and learn research computing skills.
- IT leaders should consider the relationship between instructional IT and research IT.

42%

of faculty who conduct research agree or strongly agree that they are satisfied with support for their research needs.

—ECAR faculty study, 2014

Meeting speakers also emphasized that institutions don’t need to be major research universities to develop an effective, integrated strategy.⁴¹

Shifting from measurements of providing IT support for research faculty to experiences with IT support, we find that only a minority of faculty with responsibilities

that include research as well as scholarly activities rate their experiences with related technologies as good or excellent (see figure 27). Even among faculty at doctoral institutions, who are most likely to conduct research that can benefit from technology-supported computing activities, the ratings were similarly low.

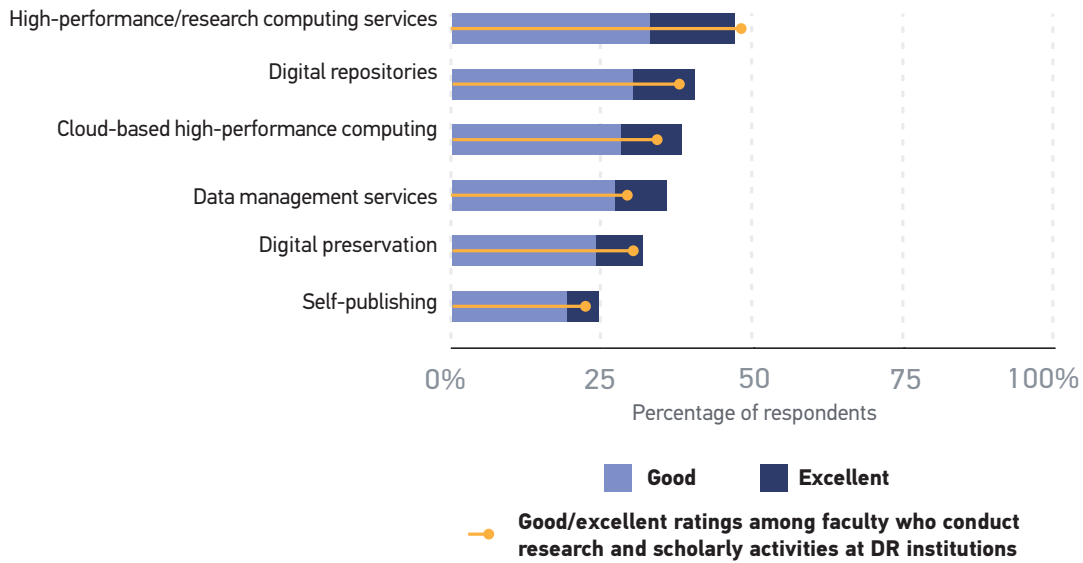


Figure 27. Faculty ratings of experiences with technologies that support research and scholarship

For faculty who indicated that they conduct data-intensive research activities that require special high-performance computing (HPC) software and equipment, about one in three (36%) generally agreed that their institution provides appropriate support for their research computing needs. This pattern holds with both tenured and tenure-track faculty ($p = 0.24$). The majority of faculty agreed that they have adequate bandwidth (59%) and data storage (51%; see figure 28). About one in three (29%) said that the wait time for research computing consultation assistance is too long; this is an indicator that IT support for HPC could be more adequately staffed. Only one in four faculty (24%) reported that most of their data are stored in the cloud, indicating that dedicated servers are still the primary source for storing research data or that faculty are unaware that their data are stored in the cloud.

36%

of faculty who conduct data-intensive research requiring special HPC software/equipment agree or strongly agree they are satisfied with the research computing technologies at their institution.

—ECAR faculty study, 2014

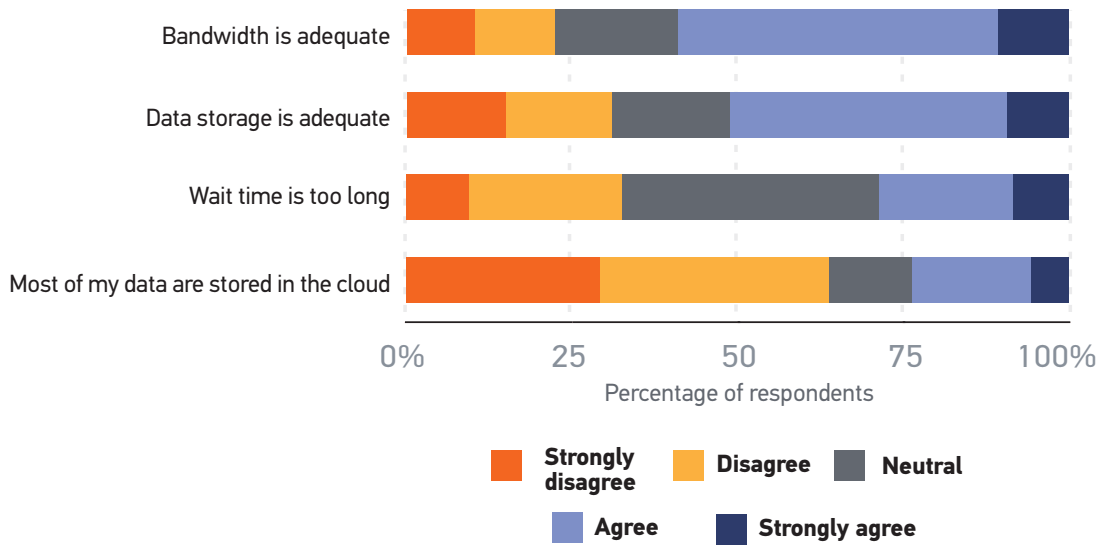


Figure 28. Faculty perspective on support for research computing

There is presently little agreement about the best scientific and research computing strategies at major research institutions. Some are investing heavily in their own research computing infrastructure. Other institutions are engaging in strategies that render themselves much more dependent on the facilities at the National Science Foundation. Still others are considering new modalities, such as cloud-based scientific and research computing, that provide increased opportunities to replicate research results cross-institutionally and internationally. While this report provides a baseline understanding of current faculty research needs and can inform these institutional-level shifts, we need further analysis to proffer specific recommendations.

Conclusion

Faculty are clearly dedicated to using technology in innovative ways that will support student learning. They are also open to professional development opportunities to improve their own practices for incorporating technology into their classes. This is a story of both promise and opportunity. Finding ways to connect the interest and motivation technology inspires in faculty with opportunities for faculty to grow their own practice is the sweet spot for IT units. Strategic support from IT leaders and tactical support from IT staff are both necessary to bridge the gaps between available technologies and integration of these technologies into teaching and learning practices. IT units must also look for ways not only to meet faculty expectations of access to appropriate and functional technologies for teaching and research but also to be innovation leaders bringing new technologies to the forefront of faculty consciousness. Faculty do not see themselves as technology detractors, and capitalizing on this by making technology adoption easy and sustainable meets faculty where they are now and can catalyze further technology innovation.

Recommendations

The data gathered through this study lead to recommendations related to each of its nine major findings.

Online Learning Environments

Invite faculty with recent online teaching experience to participate in developing a strategy for online learning. These faculty not only have the experience necessary to inform the strategy but can also be the champions to foster widespread buy-in among the general faculty ranks.

Student Success Analytics

Support faculty interests in providing students with early alert and intervention notifications through integrated planning and advising system (IPAS) solutions. These solutions should be seamless, easy to use, and interoperable with other campus data systems.

Collaborate with academic units to develop a communication plan that demystifies the concept of “big data” by highlighting possibilities and practical implications for leveraging analytics to support progress tracking, degree planning, and early alert systems. Faculty see the practical gains in student success measures more as a result of their “in the trench” interventions than because of higher-order gains from the aggregate and cumulative impact of analytics.

Learning Management Systems

Assess or continue to assess faculty usage of the LMS and their satisfaction with its specific features and functions. CDS respondents overestimated faculty satisfaction with the LMS, and the best way to reconcile this gap is to study local practices and experiences.

Offer faculty robust initial LMS training and ongoing professional development opportunities to integrate the LMS into their courses. The next-generation LMS will have more features and options that maximize customization and interaction opportunities for faculty and students, and on-boarding faculty with early and continuous training will position your institution for success in this new paradigm.

Invest in LMS products that are intuitive and adaptable, and provide instructional design support for faculty who want to explore more sophisticated uses of the LMS in their courses. Most faculty currently use only the

basic features of the LMS (e.g., to push out content); few use the LMS in ways that engage students inside or outside the classroom. Intuitive systems can maximize faculty adoption of the LMS features, and adaptable systems can grow with faculty (and student) expectations of the tools.

Professional Development

Create or curate a portfolio to demonstrate the evidence of the impact of technology-enhanced curricula on student learning. Faculty motivation for incorporating more/better technology is driven less by monetary compensation and more by things like confidence that technology will have a positive impact on student outcomes. This evidence-of-impact portfolio should be meaningful to your campus and should include reliable quantitative data as well as qualitative stories about the benefits of technology.

Develop a targeted approach to professional development, including specific faculty and specific technologies, with the intent to integrate technology into coursework. Part-time and faculty with less than 10 years of teaching experience are most interested in more tech training, so focusing on early technology integration wins with these faculty could lead to long-term wins with veteran faculty. Focusing on a few technologies that matter most will also provide quick returns on professional development investments.

Mobile Devices

Identify the technology champions on your campus and work with them to create peer-supported (or peer-driven) professional development opportunities for other faculty. Use their success stories as exemplary practices and harness their testimonials to build a body of evidence to support the technology-infused culture among faculty. A large percentage of the faculty occupy the middle ground when it comes to technology use and integration; they may need only a little convincing to experiment with technology integration in their own classes.

Assess your institutional capacity to support the proliferation of mobile devices from an infrastructure perspective and a teaching and learning perspective, and create specific strategies to achieve the desired outcomes for each. IT units are in a unique position to create a culture of connectedness, with seamless and ubiquitous campus-wide Internet access and facilitated integration of user-owned mobile technologies into classes. The former is really an infrastructure issue, while the latter is an attitude and skills issue; each will need specific and unique action plans.

Cultivate scenarios whereby faculty and students can experiment with mobile devices in class to foster the discovery of new ways of using these devices for teaching and learning. Encourage faculty to allow students to experiment using these devices in class. This can demystify mobile technologies for teaching and learning applications and lead to more creative, engaging, and interactive uses.

Technology in Faculty Work Spaces

Audit virtual and physical collaborative spaces to ensure the technology is appropriate and adequate. Most faculty are generally positive about their technology experiences, but the lowest satisfaction ratings were for shared or collaborative work spaces (e.g., computer and research labs or forums for virtual collaborative work).

Equip classroom and laboratory spaces with reliable, up-to-date software and hardware. Building faculty confidence in technology performing as expected can improve the image of campus technology and the willingness of faculty to incorporate new aspects of technology into their teaching and research practices.

Technology Support

Reconcile your technology support offerings with faculty technology support needs (and satisfaction levels) to ensure that resources are expended wisely. Some faculty are ready for technology innovation, while other faculty simply want traditional classrooms with basic technologies that are available and reliable. Raising awareness of technology support offerings is a good first step toward expanding the reach of instructional technology support and closing any gaps between faculty needs and institutional offerings for technology support.

Experiment with different on-demand modalities such as chat/IM, text, and social media for help desk support. Phone, e-mail, and walk-in support are the most frequently offered and the most frequently used forms of help desk support, but the causal vs. corollary relationship is not known. If you want to expand or change the standard delivery modalities for help desk support, offering and advertising the services in new formats is a reasonable way to begin the shift.

Security and Privacy

Raise faculty awareness of everything the institution is doing to safeguard personal, student, and institutional data, and help faculty understand fully their individual roles and responsibilities. Raising user awareness can mitigate risk and also build faculty confidence in the institution's practices to safeguard their data.

Research Faculty

Develop (or refresh) an integrated strategy for e-science to support faculty's research needs. Institutions must first define their strategy for supporting research before proceeding to assess the possibilities for aggregating demands for cyberinfrastructure, collaborating with faculty on service design, and strengthening faculty support and training.

Assess the wait time for research computing consulting and assistance to inform the adequacy of staffing levels and the efficacy of processes for technology support for research faculty. One in three faculty say they have to wait too long for technology assistance with their projects, which is a substantial proportion of faculty conducting data-intensive research.

Methodology

The ECAR faculty technology study is conducted in the same manner as the annual ECAR student technology study. These studies 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 January 31 and March 14, 2014, and 17,451 faculty from 151 institutional sites responded to the survey (see demographic breakdown in table A). ECAR issued \$100 or \$200 Amazon.com gift cards to 19 randomly selected faculty respondents who opted into a drawing; the opportunity drawing was offered as an incentive to participate in the survey. In exchange for distributing the ECAR-deployed survey to their faculty, participating colleges and universities received files containing anonymous, unitary-level (raw) data of their faculty responses, along with summary tables that compared 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. Demographic breakdown of survey respondents

Basic Demographics	U.S.	Canada	Other Countries
Male	47%	51%	61%
Female	53%	49%	39%
White	90%		
Black	3%		
Hispanic	3%		
Other/Multiple	4%		

Cont'd

Faculty Profile	U.S.	Canada	Other Countries
Percentage of respondents who primarily work with undergraduate students	74%	68%	58%
Percentage indicating experience with technology for teaching and learning	93%	93%	79%
Percentage indicating experience with research and scholarship	40%	46%	61%
Percentage opting for "short" 10-minute survey	61%	61%	62%
Percentage opting for "long" 20-minute survey	39%	39%	38%
Tenure status	50%	63%	38%
Full professor status	29%	33%	14%
Associate professor status	26%	22%	13%
Assistant professor status	23%	14%	13%
Instructor status	11%	12%	5%
Other academic rank/no rank	11%	18%	54%
Five+ years of FT teaching experience	72%	78%	66%
Five+ years of any teaching experience	55%	64%	50%
Median years in a FT faculty position	10	12	8
Mean years in a FT faculty position	12.6	14.2	10.5
Full-time faculty member	69%	79%	86%
Part-time faculty member	31%	21%	14%
Teaching/Research Area	U.S.	Canada	Other Countries
Agriculture	2%	4%	2%
Bio/life sciences	6%	8%	5%
Business	9%	9%	12%
Communications	3%	2%	2%
Computer/information sciences	4%	4%	10%
Education	9%	6%	4%
Engineering	4%	6%	19%
Performing arts	4%	2%	2%
Health science	11%	17%	4%
Humanities	11%	11%	9%
Liberal arts/general	5%	2%	2%
Manufacturing	<1%	1%	<1%
Physical sciences	9%	9%	13%
Public administration, etc.	1%	1%	1%
Social sciences, including history and psychology	11%	13%	7%
Other, please specify	8%	6%	7%

Cont'd

Institutional Demographics	U.S.	Canada	Other Countries
AA	2,578		
BA Public	324		
BA Private	585		
MA Public	2,496		
MA Private	3,011		
DR Public	5,799		
DR Private	367		
Canada		917	
Non-U.S.			1,374
Total = 17,451	15,160	917	1,374

Countries represented in the non-U.S. sample:

- Canada
- Egypt
- Finland
- France
- Ireland
- Italy
- Kazakhstan
- Kuwait
- Kyrgyzstan
- Lebanon
- Morocco
- South Africa

The quantitative findings in this report were developed using all survey responses, yielding a less than 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 <0.001 level unless otherwise noted. Findings from the EDUCAUSE Core Data Service and the 2014 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 151 college/university sites that participated in the 2014 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 joining us in this inaugural exploration of faculty views of technology in higher education.

This work was supported by the project's subject matter experts. Thank you for your insights about what matters most to higher education with regard to the questions we asked in the survey and the interpretation of the findings:

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- J.D. Walker, Research Associate, University of Minnesota

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Appendix A: Participating Institutions

Aalto University
Abilene Christian University
Al Akhawayn University in Ifrane
Alma College
American University of Central Asia
American University of Kuwait
American University of Rome
Appalachian State University
Auburn University
Baldwin Wallace University
Bellevue University
Blue Ridge Community College
Brandman University
Brown University
Bucks County Community College
California Polytechnic State University,
San Luis Obispo
California State Polytechnic University,
Pomona
Canadian University College
Catawba College
Cecil College
Central Connecticut State University
Central Virginia Community College
Chadron State College
Chandler-Gilbert Community College
Chatham University
College of Saint Benedict/Saint John's
University
College of the Desert
Collin County Community College District
Confederation College
Dabney S. Lancaster Community College
Danville Community College
DeVry University
Dublin City University
Eastern Illinois University
Eastern Kentucky University
Eastern Shore Community College
Estrella Mountain Community College
Fullerton College
GateWay Community College
Geneva College
Georgia College & State University
Georgia Southern University
Germanna Community College
Glendale Community College
Grace College and Seminary
Grand Canyon University
Hollins University
Hunter College/CUNY
Illinois Central College
J. Sargeant Reynolds Community College
John Tyler Community College
Joliet Junior College
Juniata College
Keene State College
Kent State University
Lawrence Technological University
LeTourneau University
Lebanese American University
Lethbridge College
Lipscomb University
Long Beach City College
Lord Fairfax Community College
Louisiana State University
Lourdes University
Loyalist College
Loyola Marymount University
Marietta College
McGill University
Mesa Community College
Michigan State University
Mountain Empire Community College
Nazarbayev University
New Jersey Institute of Technology
New River Community College
Northern Michigan University
Northern Virginia Community College
Oakland University
Oregon State University
Pacific University
Paradise Valley Community College
Patrick Henry Community College
Paul D. Camp Community College
Pennsylvania College of Technology
Phoenix College

Piedmont Virginia Community College	Thomas College
Pima County Community College District	Thomas Nelson Community College
Pitzer College	Tidewater Community College
Purdue University	Truman State University
Rappahannock Community College	University of Arkansas
Rio Salado College	University of Delaware
Saint Mary's University	University of Maryland
Saint Mary's University of Minnesota	University of Minnesota
Saint Michael's College	University of Minnesota Duluth
Salve Regina University	University of Minnesota–Crookston
Sauk Valley Community College	University of Minnesota, Morris
School of the Art Institute of Chicago	University of Minnesota–Rochester
Scottsdale Community College	University of Mississippi
Seton Hall University	University of Nebraska Medical Center
Shenandoah University	University of Nebraska at Kearney
Sonoma State University	University of Nebraska at Omaha
South Dakota State University	University of Nevada, Las Vegas
South Mountain Community College	University of New Mexico
Southern Methodist University	University of North Dakota
Southern New Hampshire University	University of Northern Iowa
Southside Virginia Community College	University of Pretoria
Southwest Virginia Community College	University of South Carolina Upstate
St. Norbert College	University of Texas–Pan American
Tarleton State University	University of Washington
The American University in Cairo	University of Wisconsin–Milwaukee
The American University of Paris	University of Wisconsin–Superior
The Ohio State University	Virginia Commonwealth University
The University of Arizona	Virginia Highlands Community College
The University of British Columbia	Virginia Western Community College
The University of British Columbia– Okanagan	Wayne State College
The University of Memphis	Wayne State University
The University of Montana	Western Washington University
The University of South Dakota	Winona State University
	Wytheville Community College

Appendix B: Validity and Reliability of Semantic Differential Constructs

To better understand the responses to items in the faculty survey, we asked individual respondents to place themselves on a series of semantic differential scales designed to measure their disposition toward information technology, their attitudes toward IT, and their usage of IT.⁴² On a 100-point slider scale, lower numbers indicated 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 indicated alternative characteristics for disposition (enthusiast, early adopter, cheerleader), attitudes (satisfied, content, pleased), and usage (always connected, central).

In terms of disposition, on average faculty were significantly more positive than negative on every single scale in this series. They were more likely to refer to themselves as IT enthusiasts, early adopters, technophiles, cheerleaders, experimenters, supporters, and radicals (see figure B1).

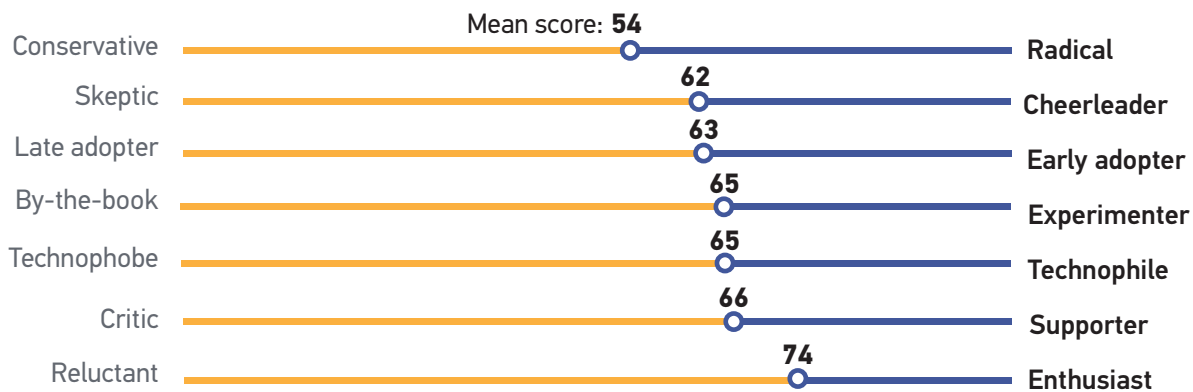


Figure B1. Faculty disposition toward technology

Faculty also had significantly more positive than negative attitudes toward IT, claiming to be more satisfied, content, and pleased than dissatisfied, discontent, and perturbed, respectively. Furthermore, they were much more likely to see IT as useful, beneficial, and an enhancement than as useless, burdensome, and a distraction (see figure B2).

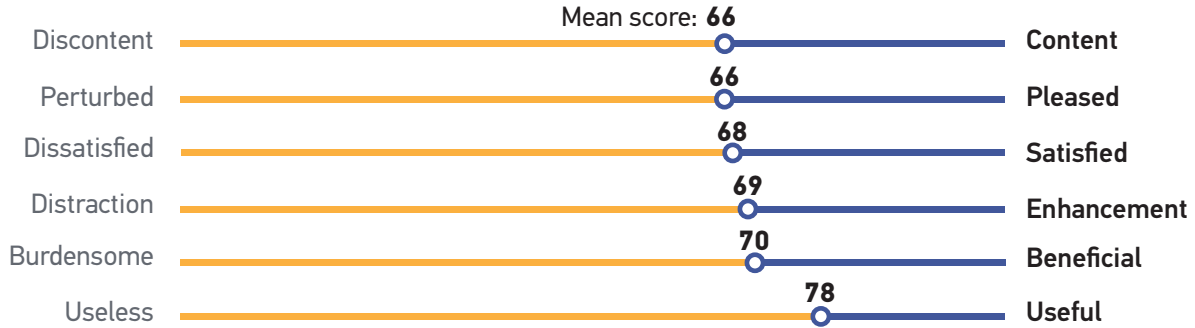


Figure B2. Faculty attitudes toward technology

In terms of usage, faculty reported on average being more connected than not, using technology frequently and voraciously, and tending to have technology and new media central to their lives (see figure B3).

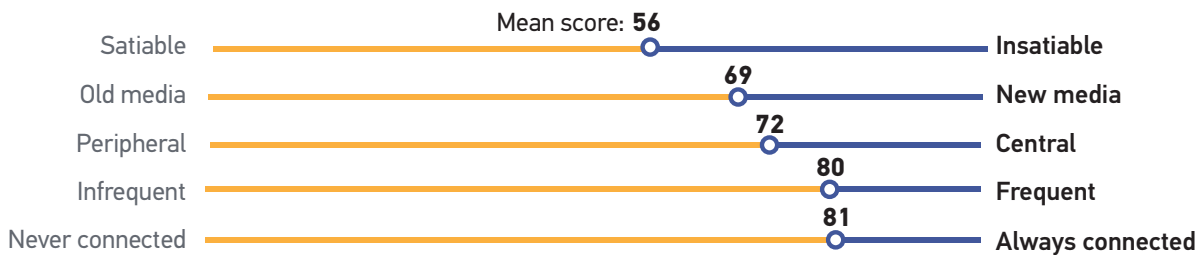


Figure B3. Faculty usage of technology

For these survey items to be useful, however, they needed to measure the a priori constructs we identified and operationalized. While each of the items associated with the constructs possessed face validity (that is, the manner in which they were grouped subjectively made sense), we needed the rigor of statistical analysis to confirm the construct validity. To do this, we employed a principal component analysis on the 18 items developed for this survey. Three primary factors (eigenvalues >1.00) were identified in the data. To interpret the results, we rotated the factor matrix with the orthogonal varimax technique, using Kaiser normalization. The items loaded precisely in the manner that we had intended, with faculty attitudes toward IT breaking out as the first factor, followed by faculty disposition toward IT and faculty usage of IT. These three factors collectively explain almost 70% of the variance in the data.

Having established the construct validity of our three measures, we then needed to identify whether the items serve as reliable measures of the constructs as questions. To measure the scale reliability of each construct, we calculated the Cronbach's alpha (α) for each group of items. The results demonstrate that our scales for faculty IT attitudes, dispositions, and usage are highly reliable, with coefficients ranging from 0.93 (excellent) to 0.89 (very good).

With the validity and reliability of our measures of faculty IT attitudes, dispositions, and usage established, we moved to generate variables based on the items that constitute each respective construct. Given the large number of cases with which we were dealing, we decided to use an unweighted average of the items as the measure for each respective construct. The averages for each construct are significantly ($p < .0001$) above the 50% threshold of the scale, suggesting that the overall attitudes, dispositions, and usage patterns of faculty are on the more positive side of the scale. The N 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.

Notes

1. Susan Grajek and the 2013–2014 EDUCAUSE IT Issues Panel, “Top-Ten IT Issues, 2014: Be the Change You See,” *EDUCAUSE Review* 49, no. 2 (March/April 2014).
2. An investigation of principal components (factor analysis) of the items for each of the semantic differential scales reveals that all items included in the survey load onto their intended dimensions of disposition, attitude, and usage, lending statistical validity to the face validity of the constructs. Furthermore, each of the scales constructed by the average of the items proves to be highly reliable.
3. Doug Lederman and Scott Jaschik, “Survey of Faculty Attitudes on Technology,” *Inside Higher Ed*, August 27, 2013.
4. Ibid.
5. Question 4.2 of the ECAR faculty survey asked respondents whether in the past year they had taught in a completely online learning environment for at least one course (no formal face-to-face interaction with students).
6. Jacqueline Bichsel, *The State of E-Learning in Higher Education: An Eye toward Growth and Increased Access*, research report (Louisville, CO: ECAR, June 2013), available from the [ECAR E-Learning Research Hub](#).
7. Katy Jordan, “MOOC Completion Rates: The Data.” For more information about MOOCs, see ELI, *7 Things You Should Know About MOOCs*, brief (Boulder, CO: EDUCAUSE Learning Initiative, November 2011).
8. Eden Dahlstrom and Jacqueline Bichsel, *ECAR Study of Undergraduate Students and Information Technology, 2014* (forthcoming).
9. The percentage of faculty who have taught MOOCs varies significantly across different types of institutions and different types of faculty but is consistently below 5%.
10. Faculty support of MOOCs is still in the minority across all Carnegie classes, even if there is notably more support among some types of institutions.
11. For more information on integrated planning and advising services (IPAS), see Ronald Yanosky, *Integrated Planning and Advising Services: A Benchmarking Study*, research report (Louisville, CO: ECAR, March 2014), and D. Christopher Brooks, *IPAS Implementation Issues: Data and Systems Integration*, research report (Louisville, CO: ECAR, June 2014), both available from the [ECAR IPAS Research Hub](#).
12. Some of the increase in students’ openness to learning analytics can be attributed to increased attention (i.e., more survey items) to learning analytics on the student study questionnaire, but the impact of response bias due to the survey instrument design was likely mitigated by the randomization of the 2014 survey instrument question placement.
13. Data come from the EDUCAUSE Core Data Service, 2013, Module 8, Question 5. For more information, please see the [CDS website](#).
14. Leah Lang and Judith A. Pirani, *The Learning Management System Evolution*, research bulletin (Louisville, CO: ECAR, May 20, 2014).

15. CDS, 2013 data.
16. Instructure Canvas was the exception with about 10% of the market share per the faculty study and 4% market share per CDS.
17. Lang and Pirani, *The Learning Management System Evolution*.
18. LMS nonusers include faculty with one or more of the following characteristics: tenured; having more than 10 years of teaching experience; having full-professor standing; working with nonundergraduate students; working at a large institution (>15,000 FTE); working at a non-U.S.-based institution; working at a public institution; and working at a BA-level Carnegie class institution.
19. Though lower than expected, given the saturation of LMSs deployed in higher education, three in five faculty rely on the LMS to the extent that they say it is critical to their teaching. In this context, 60% agreeing that the LMS is critical is a win for IT units that support these systems, as it affirms that for the majority of faculty, technology is an essential part of how they teach and how their students learn.
20. George Kroner in collaboration with the Edutechnica team, "[Does Your LMS Do This?](#)" *Edutechnica*, January 7, 2014.
21. CDS, 2013 data.
22. Veronica Diaz et al., *7 Things You Should Read About the LMS/Learning Ecosystem*, brief (Louisville, CO: EDUCAUSE Learning Initiative, April 2014).
23. CDS, 2013 data, Module 3, Question 2.
24. Kroner, "Does Your LMS Do This?"
25. CDS, 2013 data.
26. "Need" is a function of faculty's stating their agreement to a statement about being a more effective instructor if they were better skilled at integrating the LMS into their courses.
27. Grajek et al., "Top-Ten IT Issues, 2014."
28. Ross Housewright, Roger C. Schonfeld, and Kate Wulfson, "[Ithaka S+R US Faculty Survey 2012](#)," April 8, 2013.
29. CDS, 2013 data.
30. Dahlstrom and Bichsel, *ECAR Study of Undergraduate Students*.
31. Eden Dahlstrom and Stephen diFilipo, *The Consumerization of Technology and the Bring-Your-Own Everything (BYOE) Era of Higher Education*, research report (Louisville, CO: ECAR, March 25, 2013), available from the ECAR [BYOD Research Hub](#).
32. Dahlstrom and Bichsel, *ECAR Study of Undergraduate Students*.
33. Two in three faculty who agreed/strongly agreed that the use of mobile devices in class can enhance learning also said they'd like more training incorporating mobile devices into courses.
34. "Most" is defined as covering 76–100% of the space.

35. CDS, 2013 data.
36. CDS, 2013 data, Module 1, Question 6.
37. There are two things to consider about the disconnect between the overall satisfaction ratings with classroom technologies and ratings for individual technologies. The disconnect could be real, i.e., overall satisfaction could be low because ECAR didn't ask about the technologies that are drawing the overall attitude rating down, or the disconnect could be imagined, i.e., though ratings are generally high for individual technologies the attitude about these as a whole is low because of general faculty dissatisfaction with technology.
38. In further analysis of the satisfaction ratings for classroom technologies, correlations between factors were mostly insignificant and entirely weak.
39. CDS, 2013 data, Module 3, Question 1.
40. Jacqueline Bichsel and Patrick Feehan, *Getting Your Ducks in a Row: IT Governance, Risk, and Compliance in Higher Education*, research report (Louisville, CO: ECAR, June 2014), available from the ECAR [IT GRC Research Hub](#).
41. Susan Grajek, *How to Excel at Research Computing in Times of Diminishing Resources, Growing Demand, and Expanding Possibilities*, research bulletin (Louisville, CO: ECAR, April 30, 2014). Another trend is for multidisciplinary support of data-intensive research (visualizations, GIS, text analysis, etc.) to be conducted in "digital scholarship centers." The Coalition for Networked Information is a leader in understanding the development of these centers, and more information can be found in a recent article: Joan K. Lippincott, Harriette Hemmasi, and Vivian Marie Lewis, "Trends in Digital Scholarship Centers," *EDUCAUSE Review Online* (June 16, 2014).
42. Charles E. Osgood, George J. Suci, and Percy H. Tannenbaum, *The Measurement of Meaning* (Chicago: University of Illinois Press, September 1, 1967).