2010

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The ECAR Study of Undergraduate Students and Information Technology, 2010

Shannon D. Smith, ECAR
Judith Borreson Caruso, ECAR and University of Wisconsin–Madison

Introduction by Joshua Kim, ECAR and Dartmouth College

ECAR Research Study 6, 2010

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EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology.

The mission of the EDUCAUSE Center for Applied Research is to foster better decision making by conducting and disseminating research and analysis about the role and implications of information technology in higher education. ECAR will systematically address many of the challenges brought more sharply into focus by information technologies.

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Foreword

In order to remember the odd sound the phrase "personal computer" once had, you would have to be at least double the average age of the respondents to ECAR's seventh annual study of undergraduates and information technology. Before the PC came along, there was nothing personal about computers; they were institutional beasts that lived in hidden lairs. Hollywood art directors struggling to convey the look of a machine most people had no visual references for tended to rely on flashing lights and whirring tape drives. It worked; the wall-sized computer in the 1960s TV series *Voyage to the Bottom of the Sea*, a sort of hybrid of an oversized chess board and a glitzy theatre marquee, seemed utterly convincing to my boyish eyes.

Then Moore's law put computers on our desktops and, eventually, in the palms of our hands. But recently, personal computing has been dematerializing again, moving back into unseen places that might, for all the end user knows, be full of machines just like the one on the USOS *Seaview*. The device on your desktop, or in your backpack or hand, increasingly works by invoking services that are snatched from the air and reside "in the cloud"—the public universe of services accessible via the Internet. Thanks to technologies that blur the boundary between local and Internet-based resources, the cloud is becoming a super-resource that makes personal applications, data, and content available any time from (almost) anywhere. This is much more than a change in the manner of delivery. It's a step toward creating an information environment that centers on the individual, not the machine—a far more personal environment than the PC, yet inherently sociable as well.

If our experience with other recent technology trends is any indication, undergraduates will be prominent among early ascenders to the cloud. College students were, after all, the first population to take up social networking in a big way; they built a culture around mobile phones long before those devices became the amazingly capable handheld computers they are today; and they were pioneers of the early World Wide Web. Students have gotten cues about the cloud from their institutions, many of which have adopted cloud-based resources such as Google Apps Education Edition and Microsoft's Live@edu. Though the consumer cloud as it exists today remains patchy and immature, we suspected when we planned our 2010 student survey that there was a sufficiently rich variety of web-based tools with "cloudy" characteristics to justify asking whether students were adopting them in their academic work and taking advantage of their collaborative potential.

The details are in Chapter 6 of this study, but it will suffice here to say that almost three-quarters of our respondent students reported using at least one of the web-based tools we asked about in a course during the spring term of 2010. Much of this use involved collaboration with other students. This comes on top of two other developments we've noted in recent years: rapidly growing ownership and use of Internet-capable handheld devices, and ongoing near-universal use of social networking sites. Taken together, these technologies give today's students an unprecedented ability to create their own information-rich environments, available everywhere all the time and linked by friendships and community affiliations. As ECAR Fellow Joshua Kim (who also wears a hat as Director of Learning and Technology for the Master of Health Care Delivery Science program at Dartmouth College) tells us in this study's introduction, for campus technology professionals this growth of consumer power means "a fundamental shift away from the ability to determine how technology is utilized on campus" and introduces an era in which "leadership equals the ability to actively follow our students, faculty, and staff." We at ECAR invite you to take a step into that era by reading this year's report.

We also extend our thanks to the many people and institutions whose contributions made this study possible. Shannon Smith returned to the study for a second year, once again bringing diligent data analysis and prizewinning writing skills to this huge and complex task. Her coauthor, Judith Borreson Caruso, conducted focus groups, managed the study's demanding institutional review board (IRB) approvals, and shepherded institutions through the survey process, in addition to contributing to and reviewing the report chapters. Gail Salaway, a former author of the study, contributed invaluable assistance in survey design and data preparation, and Mark C. Sheehan shouldered the task of "buddy checking" the manuscript. Toby Sitko and Gregory Dobbin guided study production, and our colleagues at the EDUCAUSE Learning Initiative, Malcolm Brown and Veronica Diaz, reviewed the chapters and gave us generous and valuable advice. We also express our deepest appreciation and respect to our former colleague Richard N. Katz, ECAR's founding director. Richard was part of the team that developed our first study of undergraduates and information technology in 2004, and he subsequently led—and sometimes authored—all of those that followed. This one, too, bears his stamp.

At each of the many institutions we worked with, individuals handled the necessary and often laborious work of securing IRB approval, developing randomized samples of student populations, and deploying the survey. Their names are listed in Appendix A with our grateful appreciation. We also extend sincere thanks to our colleagues at Passaic County Community College, Stevens Institute of Technology, The University of Memphis, and The University of South Dakota for helping us organize focus groups with their students. Finally, we thank the 36,950 student survey respondents who shared their practices, their thoughts, and their time. Their generosity provided not only the data, but also the inspiration and vision that made this study a pleasure to produce.

Ron Yanosky
Boulder, Colorado

1 Executive Summary

I love IT. IT is my life. My laptop is my life. Without IT I would be a very unhappy person. IT allows us to do so many things, and those of us who are natural at it wouldn't be the same without it. So far my experience with IT at college has been a positive one. It's an exciting experience.

I don't like all this digital stuff. I don't like all the problems that come along with computers. I don't really understand most of it, and there's always something new to learn right after you get used to one thing.

—Undergraduate students' comments submitted with this year's survey

Google announced the launch of Gmail in a press release issued on April Fool's Day in 2004. According to the release, Gmail was created after a Google user complained about existing e-mail services, although its title, "Search Is Number Two Online Activity—Email Is Number One; 'Heck, Yeah,' Say Google Founders," is a pretty clear indication that this was a strategic decision. Hotmail, Yahoo, and several sites now long gone had been around for years and, according to the market research firm comScore, both Hotmail (Windows Live Hotmail today) and Yahoo have more users today. But Gmail, with its promise to let users keep all their e-mail available and searchable for years in a generously sized web-based mailbox, changed the game. By the time Gmail officially exited beta status in July 2009, Google had released a dazzling array of eponymously named add-ons and integrated applications that enabled users to manage calendars, contacts, and tasks as well as documents, spreadsheets, presentations, and forms, all on the web.[1]

The idea of using the Internet as a giant storage drive in the sky has not taken long to catch on among computer users. College freshmen have been coming to campus for years with personal web-based e-mail addresses, but today many of them also arrive with accounts on YouTube, iTunes, Facebook, and countless other popular websites where they access and store gigabytes of data who-knows-where. USB may one day go the way of the eight-track tape as laptops, netbooks, smartphones, and other portable devices enable students to access their content from anywhere. They may or may not be aware of it, but many of today's undergraduates are already cloud-savvy information consumers, and higher education is slowly but surely following their lead. Some students use these tools on their own to support their learning experience, but innovative instructors are experimenting with ways to bring the familiar into the classroom using YouTube videos, iTunes U podcasts, Facebook, and other well-known websites. Our students may not have learned how to use most of these popular cloud-based tools from us, but these tools appear to be poised to become an integral part of the college experience.

A few weeks after Google announced Gmail in April 2004, ECAR finished the survey that was used in our first-ever ECAR study of undergraduate students and information technology. This 2010 edition marks our seventh report on technology and the college experience. Our survey continuously evolves along with the technologies being used in higher education, and this year we take a closer look at cloud-based (specifically, web-based) applications and resources. While the tools students are using may vary, some of our findings, particularly about students' assessments of their own technical skills and their opinions on the use and effectiveness of IT, resonate year after year regardless of specific technologies under investigation. As we explore the changing landscape of students' ownership and use of technology, our goal is to provide college and university administrators, particularly those charged with implementing the technology environments in which these students will learn and grow, with reliable information on undergraduates' behaviors, preferences, and overall satisfaction with technology.

Methodology and Study Participants

The *ECAR Study of Undergraduate Students and Information Technology, 2010* builds on and extends previous studies and consists of the following data collection and analytical initiatives:

- a literature and survey review extending previous years' reviews;
- a web-based quantitative survey of college and university freshmen and seniors at 100 U.S. four-year institutions and general students at 27 U.S. and Canadian two-year institutions;
- student focus groups, providing qualitative data from 84 students from 4 institutions;
- student comments from written responses to the open-ended survey questions used to illustrate discussions of findings; and
- a comparison of longitudinal data from the 2007, 2008, 2009, and 2010 surveys where available.[2]

As in past studies, student respondents are weighted toward what we typically view as traditional students. Of the 36,950 respondents, more than three-quarters come from U.S. four-year institutions (34% freshmen and 42% seniors), and the majority of respondents are under 25 years old (78%) and go to school full time (86%). Responses are also somewhat biased toward doctoral institutions (56%), larger institutions (72% in institutions that enroll more than 8,000 students), and public institutions (75%). We have seen a steady increase in AA institutions participating in the study over the last few years. This year, 26 AA institutions participated in the study, contributing about 12% of student responses, up from 12 AA institutions accounting for 8% of student respondents in 2009, and 8 AA institutions making up 12% of the respondent base in 2008.

Key Findings

The responses to our annual student survey reveal themes about undergraduates' IT experience, including student technology ownership, use of and skill with IT, experience with IT in courses, and perceptions about how IT contributes to their academic experience. Survey responses told us a great deal about how students use certain types of technology, including handheld devices, both in and out of the classroom. The following sections highlight findings that stand out as especially interesting or relevant for higher education administrators as they develop plans to support the IT requirements and desires of their students.

How Students View Their Own Technology Adoption and Information Literacy

ECAR maps student responses to a set of statements about technology adoption into five categories: innovators, early adopters,

mainstream adopters, late adopters, and laggards. Students' technology adoption category is often strongly associated with their use and experience with IT both generally and in the academic context. Student responses have been quite consistent over the years of the ECAR student studies, and this year's respondents' answers retain the traditional distribution of a rough bell curve with about half (49%) of all respondents identifying themselves as mainstream adopters. However, there is a persistent gender gap: about half of the male respondents see themselves as innovators or early adopters versus just a quarter of females choosing these categories.

ECAR also asked three survey questions about how students view their own information literacy skills. Eight out of 10 (81%) students considered themselves expert or very skilled in searching the Internet effectively and efficiently. While lower than their Internet searching skills, students' overall ratings for the other two skills we asked about were generally high: more than half (57%) of respondents rated their ability to evaluate the reliability and credibility of online information as expert or very skilled, and slightly fewer than half (48%) rated their understanding of related ethical and legal issues at the same level.

Student Ownership and Use of Technology

While respondent ownership of computers has remained steady at around 98% for the last four years, the ratio of ownership between laptops and desktops has changed notably. Desktop ownership declined by more than 25 percentage points from 2006 to 2009, while laptop ownership increased by nearly as many points (see Figure 1-1),[3] but desktop ownership seems to be stabilizing. About 45% of respondents owned desktops this year and last year. For the first time, in 2010 we distinguished between "full-sized" laptops and "small, lightweight" netbooks and found that 89% own either a laptop or a netbook.

As in previous years, IT administrators concerned about supporting obsolete student equipment can take comfort in the relatively up-to-date profile of computer ownership. More than half said their newest computer, whether laptop, netbook, or desktop, is one year old or less, and 7 out of 10 reported

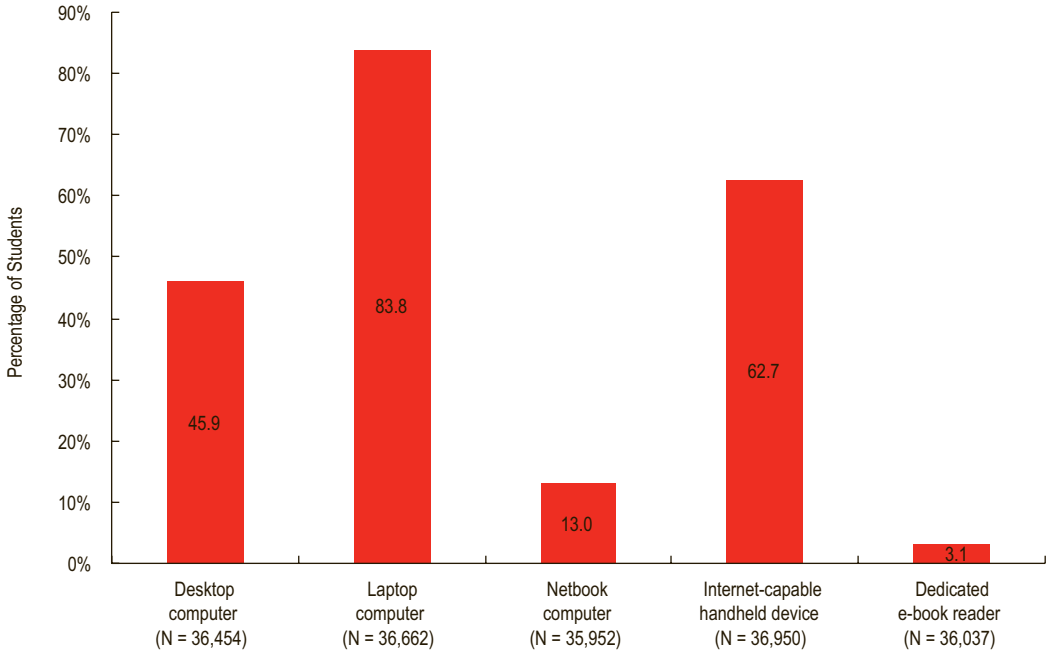


Figure 1-1. Overview of Technology Ownership

owning a machine two years old or less. However, many respondents own older computers, including 17% whose newest computer is four years old or older and nearly half who said they own a desktop that is four or more years old.

When we asked students about their IT activities undertaken for school, work, or recreation, we found that basic technologies commonly used in coursework continue to be very widely used. This year more than 94% reported using their institution's library website for school, work, or recreation, and more than a third of respondents use it several times a week or more often. In addition, more than 9 out of 10 respondents reported using presentation software and course or learning management systems, and more than 85% were using spreadsheets.

Students are also creating and sharing content, as revealed in responses to our questions about Web 2.0 user-driven sites. Close to the same numbers of respondents said they contributed video to video websites (42%) and updated wikis (40%), while slightly more than a third of respondents said they contribute to blogs (36%). About a quarter of respondents said they played online multiuser computer games and used social bookmarking/tagging websites.

Interactive Communication Tools

Communications technology continues to dominate students' use of IT, as more than 9 out of 10 respondents said they use text messaging and access social networking websites, and the median frequency of use is daily for both. Four of 10 use voice over computer-based Internet protocol (VoIP) services such as Skype, with a median use of monthly. Internet-capable handheld devices are growing in popularity; two-thirds own one of these devices (refer to Figure 1-1), and about half of this year's respondents said they use the Internet from their device daily, up from about a third of last year's respondents (see Figure 1-2).

Last year we observed that students were moving into the mobile Internet in complex, nuanced ways and identified four emerging types of student adopters of the mobile Internet, as shown in Figure 1-2:

- power users who own and use their devices to access the Internet weekly or more often;
- occasional users who own devices but use them to access the Internet monthly or less frequently;
- potential users who own but don't use their device or do not own a device but plan to purchase one in the next 12 months; and
- nonusers who did not own a device or plan to purchase one in the next 12 months.

The mix of user types among this year's respondents shows students are adopting the mobile Internet in ways that we would expect for a maturing technology, with an increase in power users and a decrease in nonusers from 2009 to 2010.

Of the roughly one-half of respondents who own an Internet-capable handheld device and access the Internet with it, more than 8 in 10 said they use it to check for information such as news, weather, sports, specific facts, etc., and about the same percentage also said they use their handheld device to send and receive e-mail. We also found social networking to be a rapidly growing application for mobile access, as more than three-quarters of our respondents said they use social networking sites (SNSs) from their handheld device, up from two-thirds among last year's respondents.

Social Networking

While the younger, so-called Net Generation students have integrated social networking more actively into their lives than older students, the gap between older and younger

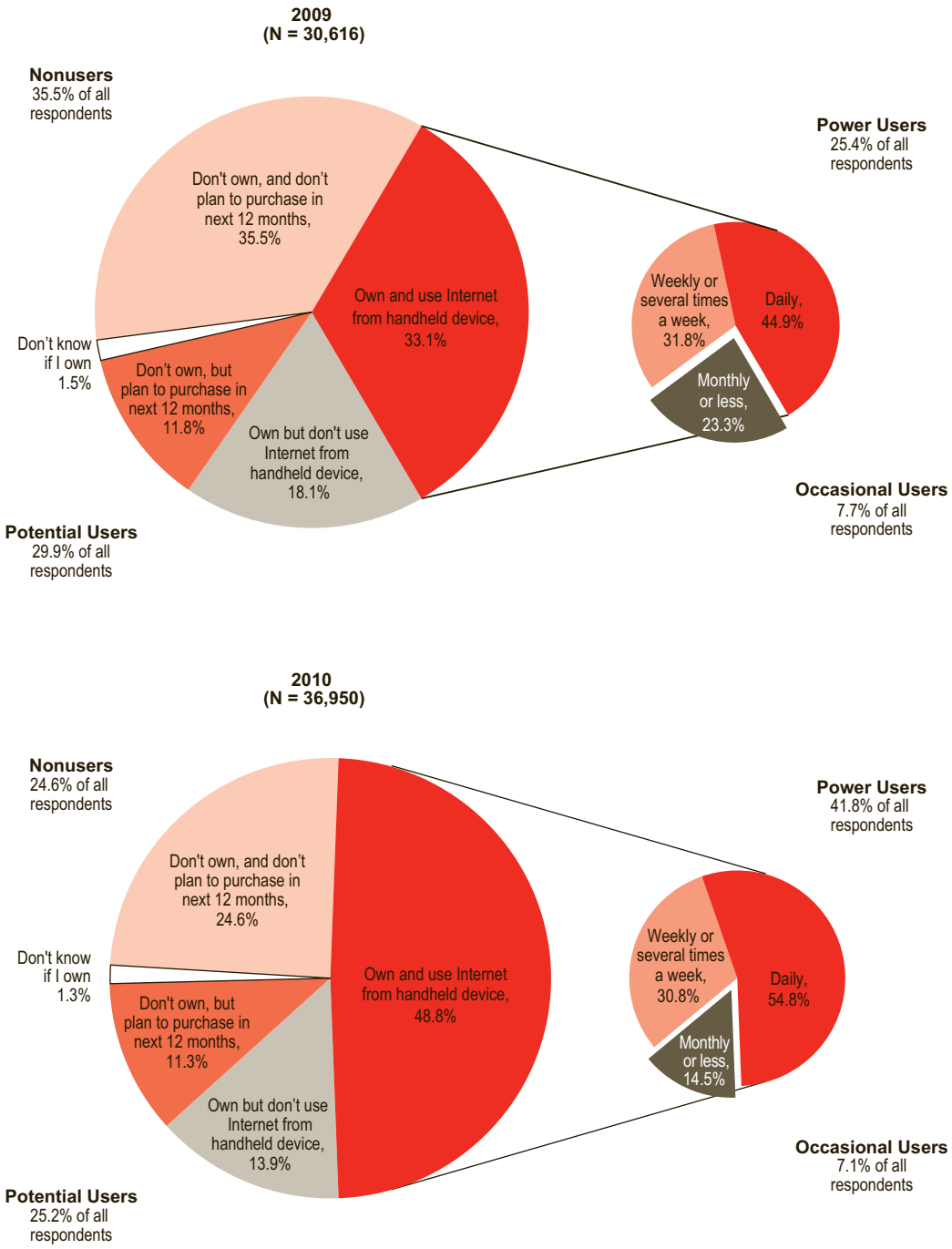
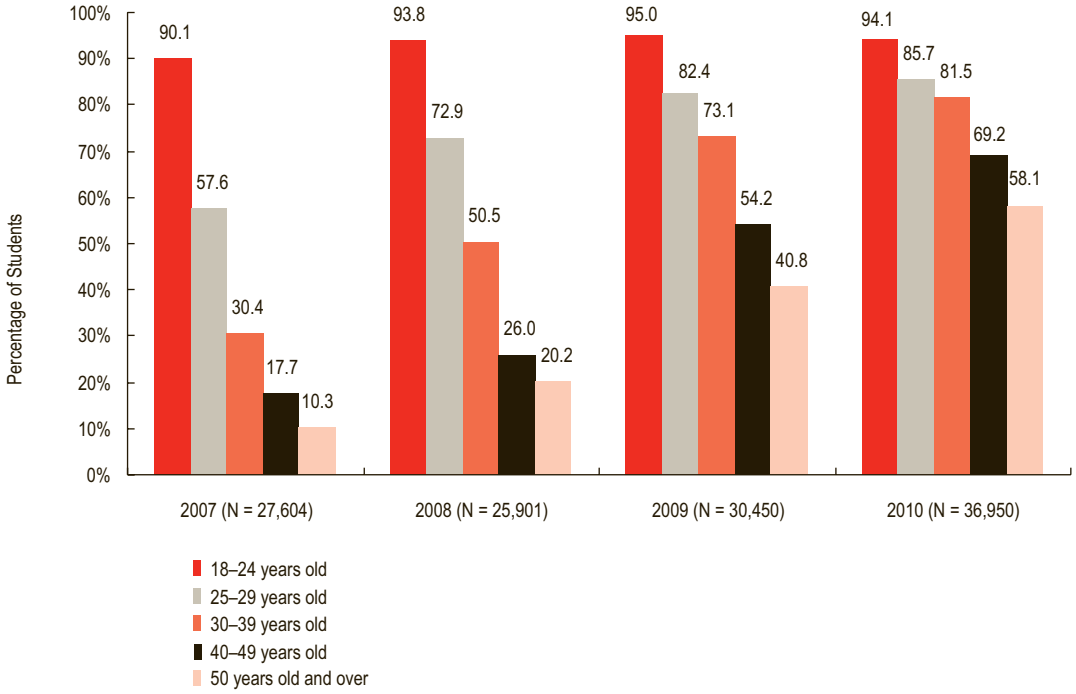


Figure 1-2. Internet-Capable Handheld Device Users, 2009 and 2010

students is shrinking. Respondents ages 18 and 19 have reported using SNSs at a nearly consistent 95% for the last four years, while students 25 and older have seen very steady increases over the same period (see Figure 1-3).

When we asked respondents to identify the social networking sites they use, some of which have other primary functions, Facebook, at over 96%, far surpassed the next closest, MySpace, with just 23%. We also asked students how they used SNSs, and from a list of 14 activities, the top two selections made by respondents were "Stay in touch with friends" (96%) and "Share photos, music, videos, or other work" (72%). Because so much attention has been

Figure 1-3. Percentage of Students Who Have Used Social Networking Websites, by Age, 2007 to 2010



drawn to privacy and security concerns when using SNSs, we were curious about whether students limited or restricted who has access to their profiles. Slightly fewer than 7% had applied no restrictions at all, and fewer than 2% said they did not know if they had. Four in 10 said they applied some restrictions, and about half said they put a lot of restrictions on access to their SNS profiles. Not surprisingly, in light of well-publicized incidents of cyberstalking and cyberbullying, we found that female respondents were more likely to put a lot of restrictions on their profiles than were males (59% versus 40%).

Technology in Courses

In addition to asking about the technologies students use for work, school, or recreation, each year the ECAR student survey asks respondents about technologies they were actively using as a part of their courses at the time of the survey (in 2010, from February 22 through April 9). This year, we divided the technologies into two groups: a core set of mostly older online and PC-based technologies, and newer web-based (or "cloud") resources with collaborative potential.

Of the core technologies, we found majorities of respondents were using the college or university library website, presentation software, and the institution's course or learning management system. About a quarter of respondents said they were using e-books or e-textbooks in a course during the time of the survey. This was the first year we asked about e-books/e-textbooks, so we don't know if this represents a rapid penetration into courses, but given that fewer than 4% of respondents reported owning a dedicated e-book reader (refer to Figure 1-1), it is likely that students are using laptop/desktop computers, or possibly smartphones or other handheld devices, to access them.

Fewer than one in five respondents said they were using course lecture podcasts or videos, and about the same percentage told us they were using clickers or student response systems as well as instant messaging and graphics software.

Web-Based Technologies and Student Collaboration in Courses

We wanted to know to what extent the members of today's college generation, who have grown up with high-speed Internet and cloud-based tools, are using such services and how they might be integrating them into their college experience. To find out, we asked if respondents were using several types of web-based tools (with examples to further describe the type of tools or services) for any of their courses during the quarter/semester of the survey. We followed up with a slightly different list and asked if the respondent was collaborating or working with other students using the tools for any of their courses during the semester/quarter of the survey (see Table 1-1).[4]

None of the tools we named were being used in courses by a majority of respondents. But reported use was high enough to suggest that cloud-based resources are making substantial inroads into students' academic lives, particularly considering that our question referred only to the current quarter/semester. Six of the 15 tools we asked about were being used in courses by one-fourth or more of respondents, and among tool users, collaborative use with other students was common. We're unable to say whether students are assigned to use these tools by instructors or are choosing them on their own; we presume that both factors are at work.

Table 1-1. Students Using Web-Based Technologies in Courses the Quarter/Semester of the Survey and Those Using the Technologies Collaboratively in Courses

Web-Based Technology	Percentage Using the Technology (N = 36,950)	Number of Users	Percentage of Users Using the Technology to Collaborate in Courses
Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)	36.2%	13,368	53.0%
Wikis (Wikipedia, course wiki, etc.)	33.1%	12,228	30.7%
Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	29.4%	10,855	49.4%
College-related review/opinion sites (RateMyProfessors, College Prowler, Unigo, College Confidential, etc.)	27.1%	N/A	
Textbook publisher resource websites (Pearson, PrenticeHall, McGraw-Hill, etc.)	26.1%	9,654	23.2%
Video-sharing websites (YouTube, etc.)	24.3%	8,962	33.4%
Web-based calendars (Google Calendar, etc.)	17.4%	N/A	
Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)	17.2%	6,345	16.9%
Blogs	11.6%	4,279	37.6%
College study support (Cramster, Turnitin, Essay Checker, ShareNotes, etc.)	10.9%	N/A	
Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)	5.4%	1,996	32.9%
Micro-blogs (Twitter, etc.)	4.3%	1,605	40.2%
Web-based to-do lists/task-managers (Remember the Milk, Ta-da, etc.)	4.3%	N/A	
Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)	2.8%	1,053	30.5%
Online virtual worlds (Second Life, Forterra, etc.)	1.4%	527	29.4%

Social Networking and Coursework

Despite the very high percentages of personal SNS use (refer to Figure 1-3), only about 3 in 10 respondents told us they were using social networking websites in their courses the quarter/semester of the survey, although half of those students were using them to collaborate with other students in a course during the semester/quarter of the survey. More than half of SNS-using respondents said they use SNSs to communicate with classmates about course-related topics, but fewer than 1 in 10 (8%) said they use them to communicate with instructors about course-related topics. Only about 3 in 10 of the respondents who used SNSs said they had accepted current or previous college or university instructors as friends or contacts on social networking sites, with seniors reporting it at the highest percentage (40%) versus freshmen (23%) and students from two-year institutions (26%). When we asked students if they would like to see greater use of social networking websites in their courses, we found that slightly more than a quarter said they would, with respondents using an SNS in a course during the quarter/semester of the survey being more likely to say so.

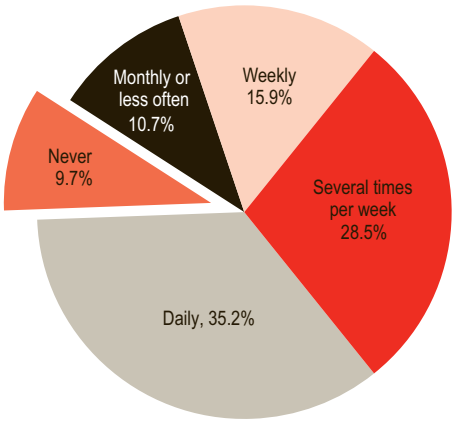
Our findings suggest to us that students are gradually integrating SNSs and other web-based tools into their academic experience. Because today's high school and college-age students have been adopting social networking and content sharing at such high rates, higher education has an opportunity to leverage these technologies. There will be challenges, and experts point out that we need to truly understand which tools students are already embracing in their personal lives, how they actually use them, and their importance. By identifying ways to adopt these tools in order to remove potential technical barriers and introduce a sense of familiarity, institutions can better prepare students to make a connection with their campus and courses and let students know they understand their needs.[5]

Course or Learning Management Systems and IT Availability

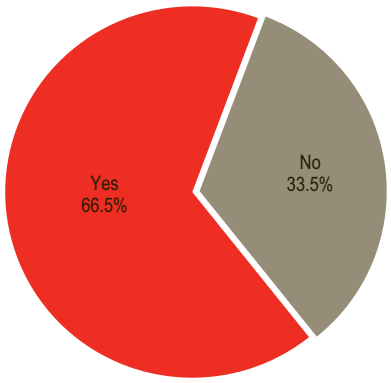
Research from the 2009 EDUCAUSE Core Data Service report confirms a prevalence of course management system (CMS) and learning management system (LMS) availability, as more than 90% of responding institutions confirmed they have at least one commercial, homegrown, or open source course management system. This is also reflected in our student study, as more than 9 in 10 respondents told us they have used a CMS (see Figure 1-4). Students appear to be relying on CMSs; more than a third of all respondents use a CMS daily, and more than a quarter said they use them several times a week. Both the overall use and daily use rates reflect increases since 2008. However, just two-thirds of those students who did use CMSs told us they were using one during the quarter/semester of the survey, which seems to indicate that not all faculty are putting courses on CMSs. A majority of Core Data Service institutions indicated that their CMSs were used selectively by faculty, but the percentage that said their CMS(s) were ubiquitous and employed for all or nearly all courses increased from 38% in 2008 to 43% in 2009.[6]

Of this year's respondents who have used a CMS, slightly more than half said that their overall experience with them is positive or very positive, but we have found over the last few studies that the percentage of respondents who feel positive or very positive about the CMS experience has dropped from 77% in 2007 to 51% in 2010.

We continue to find that respondents who use a CMS more frequently report more positive experiences using a CMS. We have also found over the last three years that when asked whether they agreed with the statement "My institution's IT services are always



How often do you use course or learning management systems (a system that provides tools such as online syllabi, sample exams, and gradebook)? Examples include WebCT, Blackboard, Desire2Learn, Sakai, Moodle, or an institution-specific system. (N = 36,950)



Are you using a course or learning management system for any of your courses this quarter/semester? (N = 33,126)

Figure 1-4. Student Use of Course or Learning Management Systems

available when I need them for my coursework," about half of respondents agreed or strongly agreed (52% this year), about a third were neutral (33% this year), and the remainder disagreed or strongly disagreed (15% this year). Over the same time frame we have consistently found that respondents' perception about institutional IT service regarding coursework availability is related to their CMS experience. Students reporting a positive or very positive experience using a CMS were much more likely to agree about IT availability than those reporting a negative or very negative experience.

Instructors' Use of IT in Courses

Other research has found that higher education instructors are a bit behind the curve when it comes to implementing IT in the classroom. The Faculty Survey of Student Engagement (FSSE) surveyed approximately 4,600 faculty members at 50 U.S. colleges and universities in the spring of 2009 and found that overwhelming majorities of faculty were not using IT tools such as collaborative editing software, blogs, plagiarism detection tools, student response systems, or video games/simulations/virtual worlds. The only technology FSSE reported faculty using extensively was course management systems.[7] Despite numerous experiments with leading-edge teaching technologies on campuses around the country, the FSSE findings suggest that many instructors continue to teach using old-school, lecture-based instruction.

In general, we have found in our study that respondents are lukewarm about their instructors' use of IT. ECAR began asking questions about students' views on instructors' use of IT in courses in 2007, and the responses to these questions have been consistent from year to year, as have the distributions of responses across student demographics and types of institutions. Fewer than half of respondents told us that "most" or "almost all" of their instructors meet the criteria stated in each question every year we have asked. Questions include whether respondents' instructors use IT effectively in their courses (47% this year), whether they have adequate IT skills for carrying out course instruction (49% this year), and whether they provide students with adequate training for IT in their courses (38% this year).

When asked to respond to the statement "I skip classes when materials from course lectures are available online" on a scale of strongly disagree, disagree, neutral, agree, and strongly agree, nearly two-thirds (64%) told us that they disagree or strongly disagree with the statement.

Student Perceptions, Preparedness, and Preferences for IT in Courses

Because IT is integrated with many student activities that influence college success, ECAR created four positive "outcome statements" about the impact of IT in courses and since 2008 has asked students whether they agree or disagree with them. Since we began this study we have found in both the quantitative and the qualitative data that students say convenience is the most valuable benefit of IT in courses, and this year 7 of 10 agreed with the statement "IT makes doing my course activities more convenient." About half of this year's respondents agreed or strongly agreed with the statement "The use of IT in courses improves my learning," and only about a third felt the same way about the statement "I get more actively involved in courses that use IT." Between 8% and 20% disagreed or strongly disagreed with these three statements.

To get a sense of how students felt about their technical skills when they started college, we asked respondents if they agreed with the statement "When I entered college, I was adequately prepared to use IT as needed in my courses." We found that half agreed or strongly agreed. We then asked them to think about the end of their undergraduate experience to find out how they felt about IT's role in the ultimate goal of a college education: getting and keeping a job. Slightly fewer than half agreed or strongly agreed with the statement "By the time I graduate, the IT I have used in my courses will have adequately prepared me for the workplace."

Surprisingly, we found no meaningful relationship between class standing and the level of agreement with either of these IT preparedness statements, nor were there any demographic factors that influenced the responses to these or any of the other statements about IT in courses. The only consistent factor associated with how a student responded to these questions was our technology adoption scale, discussed earlier in this chapter. Innovators and early adopters agreed or strongly agreed with all of these statements at higher levels than did mainstream/late adopters and laggards.

Technology adoption is also closely associated with what may be the ultimate question regarding IT in a student's undergraduate experience: how much IT do they prefer in their courses? Using a 5-point scale from "no IT" to "exclusive IT," we have found since we began asking seven years ago that the responses have been remarkably consistent. Majorities of students (between 55% and 60%) have told us every year that they prefer only a "moderate" amount of technology, while fewer than 5% of respondents prefer the extremes—either no IT or exclusive IT in their courses.

It is surprising that the desire for moderate IT in courses has been this consistent over the years when students' use of technology in their personal lives, such as text messaging, social networking, and using mobile devices, has increased. One possible explanation is that what respondents in 2004 considered a "moderate amount of IT" may be quite different from what today's respondents consider moderate. Would a mainstream adopter in 2004 think that watching videos on the Internet and discussing them via Facebook chat with a classmate was a moderate or an extensive use of IT in a course? The hybrid courses that have emerged utilizing CMSs, video websites, and other tools as supplements to face-to-face courses might have been viewed as extensive use by mainstream adopters of a few years ago, whereas today's mainstream adopters might consider them to be just the right, or moderate, amount of IT in their courses. As users encounter and employ IT without even thinking about it, the oft-mentioned "commoditization of IT" could be shaping just what a student considers to be innovator-level or laggard-

level technology adoption as well as just what "moderate" might mean when asked how much IT they prefer in courses.

Conclusion

Google is well known for playing April Fool's Day pranks, and when Gmail was announced on April 1, 2004, many people thought the campy press release that had Google founders saying "Heck, Yeah" to the then-unheard-of offer of one gigabyte of free e-mail storage for life to be a joke. A Google representative denied that Gmail was a hoax but did not comment on the job posting on the company's website on the same day seeking staff for a space mission with a project dubbed the "Google Copernicus Hosting Environment and Experiment in Search Engineering," or GCHEESE. Six years later, Google doesn't have a lunar hosting environment, but they do have a patent on an ocean-powered data center. They may need both in order to accommodate the worldwide growth in cloud-based consumer applications and the changing economics of personal data.

What will undergraduates who have come to adulthood during an era in which data location is incidental, if not invisible, expect of their institutions and how will student adoption of cloud-based applications play out on campus? Our study suggests that mobile computing is on the rise, and cloud-based applications and resources are catching on among undergraduates. But it also reveals that many student technology adoption patterns are surprisingly stable, even as the technologies themselves change dramatically; and students continue to express a desire for a moderate level of technology in their courses, even if we can't be sure exactly what moderate or extensive technology means to them. Perhaps the most important take-away from our study, this year and every year, is that there is no stereotypical student when it comes to technology.

Endnotes

1. "Google Gets the Message, Launches Gmail," Google Press Center, April 1, 2004, http://www.google.com/press/pressrel/gmail.html; Experian Hitwise Data Center, "Top 20 Sites & Engines," September 4, 2010, http://www.hitwise.com/us/datacenter/main/dashboard-10133.html; and Matthew Glotzbach, "Google Apps Is Out of Beta (Yes, Really)," The Official Google Blog, July 7, 2009, http://googleblog.blogspot.com/2009/07/google-apps-is-out-of-beta-yes-really.html.
2. We began comparing longitudinal data in the student study in 2005, the study's second year. That year, most of the differences were found to be minor and statistically insignificant, but a few were identified as noteworthy. Where questions were consistent, more robust longitudinal analysis of repeated questions was performed in 2006 through 2010.
3. From 2006 to 2009, desktop ownership declined from 71.0% to 44.0% while laptop ownership increased from 65.4% to 88.3%. This was among only those institutions that participated every year from 2006 to 2009 (see Chapter 4 in the 2009 study).
4. Table 1-1 reports collaborative use only among those respondents who said they were using the technology in a course during the quarter or semester of the survey. Substantial numbers of those saying they did not use the technologies during the quarter or semester of the survey also reported collaborative use, perhaps because they were using it incidentally or their instructor had not initiated the use.
5. David F. Ullman and Blake Haggerty, "Embracing the Cloud: Six Ways to Look at the Shift to Cloud Computing," *EDUCAUSE Quarterly* 33, no. 2 (2010), http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/EmbracingtheCloudSixWaystoLook/206528.
6. EDUCAUSE, "2009 EDUCAUSE Core Data Survey," (EDUCAUSE, 2009), http://www.educause.edu/coredata/. Finding was generated directly from the Core Data.
7. "Professors' Use of Technology in Teaching," *The Chronicle of Higher Education* (July 25, 2010), http://chronicle.com/article/Professors-Use-of/123682/?sid=wc&utm_source=wc&utm_medium=en; Faculty Survey of Student Engagement, http://fsse.iub.edu/.

2
Following Their Lead: An Introduction

Joshua Kim, ECAR and Dartmouth College

The publication of the seventh annual ECAR study of undergraduate students and information technology provides us with an opportunity to reflect on what has changed and what has remained constant in academic technology since the study began in 2004. I believe this is an important exercise for those of us in higher education IT because the fundamental differences and consistencies in college undergraduates' use of IT between 2004 and 2010 could serve as a guide to our constituents' technology needs and desires for the next seven years.

Looking at the past seven years from the twin perspectives of higher education IT and communication and information technology in general, we will likely conclude that

- technology, and therefore how our students use and think about technology, has changed remarkably; and
- campus IT has changed far less dramatically.

Will these conclusions also describe how the next seven years have unfolded when we sit down to read the ECAR study of undergraduate students and information technology of 2017? Despite uncertainties shaped by today's weak global economy, we can still predict with a degree of confidence what our colleges and universities will look like, but it is almost impossible for us to predict with precision where technology will be and therefore how our students will be using technology on campus. What is possible, however, is to think through the broad trends that drive the interaction of learning and technology. In this introduction, I argue that we, as campus technology professionals, are experiencing a fundamental shift away from our ability to determine how technology is used on campus and that we are rapidly entering an era in which leadership equals the ability to actively follow our students, faculty, and staff. This shift is fundamentally undergirded by three shifts in the educational technology landscape, all of which are briefly touched on in this chapter and discussed in greater depth throughout this study. These shifts include the rise of social networks, the growth and near ubiquity of mobile devices, and the ascension of the cloud.

There is an underlying tension in campus technology between services that are paid for and provided by the institution (enterprise services) and those technologies that students bring to campus (consumer services). Facebook and YouTube, consumer services, are being used by some faculty in lieu of, or in addition to, the enterprise course management system and lecture capture system. The computer lab, an enterprise-managed service, is gradually yielding functions to

student-owned consumer technology such as desktops, laptops, and, more recently, tablets such as the iPad. Google Docs is a consumer technology that is gaining in both name recognition and user familiarity and is clearly shaping how institutions think about enterprise-wide licenses for comparable tools. And the line between enterprise and consumer technology is blurring in some cases. If a campus decides to implement a consumer-based e-mail/calendaring system such as Google Apps for Education and to integrate this service with the institution's existing directory (authentication) system, is this a consumer or enterprise service?

This rising tide of consumer information services will displace familiar campus-based tools, creating turbulence where the two domains meet and stimulating a competition between mature but declining enterprise systems on the one hand and raw but innovative consumer systems on the other. We struggle to get our enterprise web services to work on mobile browsers just as the mobile (iPhone/iPad/Android) app is emerging as a preferred interface to interact with services and content. We invest large sums to license online library databases but struggle with both copyright restrictions and technological hurdles to bring our curricular and library content to the mobile devices that our students increasingly come equipped with, such as the iPad or Kindle e-book reader.

Changes and Constants Since 2004

Today, students probably don't view faculty teaching with PowerPoint and overhead projectors as a "technology" in our classrooms. They are as constant and expected as whiteboards, heating and air conditioning, and electricity. In the same way, we are rapidly moving to a time in which students (and all of us involved in higher education) will no longer think of the Wi-Fi network, the CMS, or online research (whether it be via library databases or Google) as technologies. Just as it is beginning to make little sense to say "digital cameras" when all cameras are digital, we may stop thinking in terms of "web-enabled" or "technology-enabled" classes and student work when so much of teaching and learning is in some way mediated by technology.

While the innovative technologies that have been introduced since 2004 may support the idea that the definition of "learning technology" is ever changing, the tools that have remained constant or have gradually evolved make an even better case. In 2004 Facebook, YouTube, iPhones, and Google Docs had not yet shown up on campus, but we did have e-mail, CMSs, Google, and Microsoft Office. We also had laptops and Wi-Fi. This year's ECAR student study reveals that the older technologies have evolved into near ubiquity, so much so that they have become synonymous with the campus environment.

The growth and entrenchment of the CMS is arguably the most important campus technology trend since 2004 because it plays such a large role in the central mission of instruction. When CMSs first appeared in the late 1990s, they were fairly basic in their functionality, and the stronger offerings had yet to rise to the top of a large number of products. Over time, institutions began to implement an enterprise CMS so that students and faculty didn't have to deal with multiple user interfaces and IT didn't have to support a plethora of systems. By 2004 that process was largely complete; aside from the occasional niche or custom-developed system, CMS products were primarily enterprise oriented in design, and most institutions had a dominant enterprise CMS.

The ECAR Study of Undergraduate Students and Information Technology, 2010 reveals that 8 in 10 students use a CMS weekly or more often, and more than a third use it daily, indicating that since 2004 the predominantly enterprise-wide CMS has become a standard (and expected) part of the campus tech-

nology landscape. The near-universal implementation of CMSs also exposes potential instructional shortcomings, because this type of innovation requires effective pedagogical utilization, in terms of course design and CMS-enabled active learning assignments, as opposed to using only the most basic CMS functions. As a learning technologist, I hope future student studies will help us understand levels and trends of advanced CMS utilization, such as the proportion of students who report use of CMS-managed discussion boards, blogs, or wikis in their courses. But the larger question may be whether consumer-based social networks, chat rooms, discussion boards, blogs, and wikis will impact, or even replace, campus use of these advanced CMS features.

In 2004, just when the idea of an institutional learning platform became the norm, social networking began to take off, and soon the idea of a closed, enterprise-wide system began to seem generic and even outdated in many contexts. We appear to be in the process of evolving from the enterprise age, in which IT cost-effectiveness is presumed to be best pursued at the enterprise/institutional center, to an era in which some functions—particularly instruction and research—are diffusing beyond the boundaries of the institutional technical ecosystem. Teaching used to stop at the enterprise level when there was no easy way to connect across domains, but today the technical barriers to crossing domains are much lower and only policy and institutional cultural constraints keep things contained within the enterprise. I would argue that students are the constituents least likely to be influenced by either constraint.

The borders of our enterprise-managed IT ecosystem have become permeable, as Yochai Benkler proposes in his article "The University in the Networked Economy and Society: Challenges and Opportunities."[1] Since the first ECAR student study, three technological developments have fundamentally changed how students use technology and are essentially enabling this permeability: the introduction and explosion of social networks, the ubiquity and power of mobile computing, and the emergence of cloud-based tools. Each of these three developments has not only altered how our students interact with their own technology and the rest of the world, they are also becoming an integral part of the services and experiences bundled with a college education.

Social Networks

The ECAR Study of Undergraduate Students and Information Technology, 2010 reveals the jaw-dropping figures that 90% of respondent students use social networking websites and 87% are on Facebook. For a service that did not even exist when the initial ECAR student survey data were collected, this is an amazing shift. And we are not talking about a small change in behavior. Six in 10 students report visiting a social network site (SNS) daily, presumably taking up a significant proportion of their total hours spent online. We don't know how the average amount of time on a CMS compares with average time on Facebook, but we can assume that the comparison would not put our enterprise educational systems in the lead.

Despite this CMS and social network usage, save for a few edge cases and some rather feeble (if well-intentioned) attempts to bring the worlds of learning and social networks together, these two technologies have remained stubbornly disconnected. The reach of the CMS continues to grow in supporting traditional face-to-face, hybrid, and online education, but its functions and usages remain apart from the social network. Students go to Facebook or MySpace for connecting and socializing and to the CMS for coursework, assessments, content, and interaction with students and faculty in a particular course. This study found that half of the students who used social networking

websites used them to communicate with classmates about course-related topics, but fewer than 8% used them to communicate with instructors about course-related topics, and fewer than 3 in 10 students said they were using an SNS in a course at the time of the survey. This pattern has not fundamentally changed since ECAR began asking about SNS use in 2008. While it is a truism within course design and pedagogical circles that "all learning is social," it seems that learning (or at least courses and student–faculty interaction) is not occurring in the online social spaces where most students congregate.

This is not to suggest that we should abandon our institutionally delivered CMS and move all of our courses to consumer-based social networks. Certainly some instructors have elected to forgo the CMS in favor of consumer-based social network tools,[2] but the overall trend seems to be both entrenchment and diffusion of the CMS into an ever-growing percentage of courses. Taken together, these twin trends of near-universal usage of social networks and the stability and utility of the CMS suggest that both of these platforms are fulfilling vital functions. The next evolution of the CMS platform should see elements of social networking, such as presence awareness and user (student) activity-sharing, emerge as tools in the course management platform. The key insight here is that the driver for CMS platforms to incorporate greater social learning capabilities is not faculty or institutional demand but student preferences shaped by consumer social networking platforms.

Mobile Internet Devices

In 2004, the category of "Internet-capable handheld device" barely existed, with the exception of a handful of Wi-Fi–enabled personal digital assistants (PDAs) and crude cell phone browsers interacting with proprietary cell carrier sites. In 2010, we learned that nearly two-thirds of students responding to this survey are now carrying one of these devices, and two-thirds of these owners use them to access the Internet weekly or more often. It is not clear, however, how many college- or education-related tasks are being done on these mobile web devices.

With the prevalence of ownership and use of these devices, it will be important for future studies to explore the use of mobile learning applications, such as Blackboard's Mobile Learn; but for now these platforms are too new to be included in the survey. The 2010 ECAR study found that the most frequent use (about 85%) of a handheld Internet device was to check for information on "news, weather, sports, specific facts, etc." And more than three-quarters of device owners use their devices to access e-mail and use SNSs. This should give us hope that when our course- and campus-related web services become available and optimized for the mobile form factor—and more instructors will incorporate social networking into their curriculum—widespread device ownership could translate into rapid adoption.

There is no doubt that mobile technology will continue its dramatic expansion as a consumer technology and will experience widespread adoption and usage among our students. Devices such as iPads, iPhones, e-book readers, and Android-powered phones (and tablets, coming soon) will erode distinctions between computer and mobile device and will see ownership levels equaling or exceeding those that laptops enjoy today on campus.

The question is whether the divergence in mobile device usage for communication and entertainment, as compared with mobile device usage for learning and campus-specific tasks, will widen or diminish. How willing will institutions be to invest in platforms, applications, and tools that bring our enterprise learning platforms to the mobile device? How quickly will campus websites be redesigned to work optimally on small screens? Will the paradigm of the "mobile app" disrupt the

ability of our campus IT departments to deliver services just as we were getting comfortable moving from a client to a web interface?

The mobile learning and campus application ecosystem is one of the few places where students can't simply "go around" existing IT infrastructures (as they can and do with Gmail and Google Docs). While students can use their handheld devices to access off-campus learning material and third-party study tools as well as to connect with fellow students in social networking websites, without the support of instructors and institutional IT, a mobile device can't do much else to enhance or enable their educational experience. Mobile learning and campus apps need to be supplied and integrated with existing campus services by campus employees (or campus-managed contractors) using campus dollars, a reality that may prove to be the pace-limiting step for education-related mobile adoption in the years to come.

The Cloud

Of the three developments considered here, cloud computing is likely to have both the most rapid uptake and the most far-ranging impact, partially because it is driven by the remarkable growth in mobility. *The ECAR Study of Undergraduate Students and Information Technology, 2010* reveals that more than a third of students were already using cloud-based productivity tools such as Google Docs for word processing, spreadsheets, and presentations, and three-quarters of respondents were using at least one cloud-based technology (such as wikis, social networking, textbook publisher sites, blogs, and video-sharing sites) in a course during the time of the survey. It is not difficult to construct scenarios in which the importance of now-ubiquitous client-based productivity applications (such as the traditional Microsoft Office suite) fades as cloud-based authoring services become more robust (and remain free). This trend will align with other developments as students move to store their files and content in the cloud so they can be accessed across all their mobile devices and computers.

The rapid adoption of Google's Apps for Education Program and the efforts of Microsoft and IBM to offer cloud-based alternatives for e-mail, calendaring, and authoring are responses to and drivers of student use of cloud-based services. How the cloud will play out from the perspective of enterprise and mission-critical institutional systems is of course a topic of great interest to the EDUCAUSE community. Despite persistent privacy concerns, the willingness of an ever-growing number of institutions to offer consumer cloud-based e-mail, calendaring, productivity tools, and storage services that are integrated with existing institutional identity management systems is evidence that the blending of lines and borders between campus and cloud services will accelerate.

A Creative Tension

The tension between enterprise and consumer services will drive much of the innovation in campus technology that we will participate in during the years to come. Enterprise systems are not disappearing: the student study continues to document the centrality and importance of enterprise systems such as the CMS (to say nothing of the technologies such as student information systems, databases, and other middleware and infrastructure on which the CMS depends). It is not the campus enterprise systems, however, that are seizing mindshare among our students. Consumer applications and tools, ranging across social networking, mobile devices, and cloud-based services, enjoy the most rapid evolution and fastest uptake across the campus. Enterprise applications are where much of the work still gets done, but the action is clearly on the consumer side.

Where do we see the creative tension between consumer and enterprise devices and services playing out?

Social networking: Demand will increase among students and purchasers for social networking features to be adopted into the product feature roadmaps of the major CMS vendors. Instruction does not move to Facebook or Ning or LinkedIn, but rather Blackboard, Moodle, Desire2Learn, and Sakai begin to adopt social-network-type features and capabilities.

Mobile Internet devices: The rapid development of platforms such as the iPad, Kindle, and iPod touch, and smartphones such as Android and iPhones (accompanied by equally dramatic price decreases) is opening up new possibilities and new demands for digital and mobile curriculum and campus services. While some may argue that mobile web devices are the purview of an affluent minority of students, the potential of these tools to reduce student expenses (think digital textbooks) will serve as an additional driver toward adoption.

The cloud: Consumer cloud-based communication, collaboration, and productivity tools have the potential to both provide superior user experiences and significantly lower costs for both students and the institutions they attend. Whatever we think about the pros and cons of cloud-based e-mail, these systems can yield cost savings and help institutions get out of the e-mail and calendaring business. Web-based word processing, spreadsheets, and design tools may not be as robust as client-based applications yet, but the cost savings for students who can avoid campus licensing fees are nontrivial, and their collaborative capabilities introduce the first really fundamentally new function these tools have seen in a long time.

The challenge for campus technology leaders will be to figure out how to incorporate into the fabric of the learning experience the consumer tools that our students arrive with on campus and prefer over applications and platforms that we have chosen to make available. This task will require a mind-shift away from provisioning services toward integrating existing (consumer) applications and devices across courses and other campus activities. We campus technology professionals will need to spend more time interacting with students and less time interacting with our servers. Only through understanding what tools our students are bringing with them and how they are using these tools to navigate their own educational experience will we discover paths toward efficient and effective innovation.

Conclusion

The ECAR Study of Undergraduate Students and Information Technology, 2010, the seventh annual study, brings into particularly sharp focus the degree to which students have become co-innovators with campus technologists in driving change in how learning is structured and delivered. Any effort to understand the changing university, and specifically how technology is undergirding educational change, will be incomplete and distorted, absent an understanding of the student technological world. More than ever, we cannot understand this student technological world by looking at the applications, services, and hardware that institutions have purchased and provide.

Our students, using the consumer technologies and practices that they arrive with on our campuses, will be defining and shaping whatever path our future will take. We can no longer hope to either determine or control how, when, or where students will use technology at our institutions. Of course, there will always be functions that are most effectively performed at the enterprise level, but the enterprise-driven model of controlling learning technology is likely facing a relative decline. Students will set the direction, choose the tools, and determine the behaviors. The best that we can do is to listen carefully and work to follow their lead.

Endnotes

1. Yochai Benkler, "The University in the Networked Economy and Society: Challenges and Opportunities," in *The Tower and the Cloud*, ed. Richard N. Katz (Boulder, CO: EDUCAUSE, 2008).
2. For a discussion of the relevant issues, see the EDUCAUSE Learning Initiative's *7 Things You Should Know about LMS Alternatives*, http://www.educause.edu/Resources/7ThingsYouShouldKnowAboutLMSAl/207429.

3
Methodology and Respondent Characteristics

I think IT has made learning more interesting. I think it's an effective way to learn because you are able to use a variety of sources rather than learning straight out of a textbook. Once you get out into the real world you won't have your textbooks with you, so having experience using IT as a learning tool helps prepare people for life after textbooks.

—An undergraduate student

ECAR launched its study of undergraduates and IT in 2004 as part of the center's founders' vision to create a body of research and analysis on important issues at the intersection of higher education and IT. The aim of ECAR's student study is to inform college and university leaders, technology staff, and faculty as they make critical decisions about their institutions' technology investments and implementations by providing an ongoing look into the IT practices, preferences, preparedness, and performance of college students. This information is particularly relevant to administrators responsible for deploying campus technologies and is useful to instructors and instructional technology staff as they decide how to incorporate IT into the curriculum.

A few of the questions our research seeks to answer are

- What types of information and communication technology equipment do undergraduate students own and how old is it?
- What applications do they use for school, work, or recreation?
- What applications are they using in their courses during the current semester or quarter?
- How do they assess their skills with various types of IT?
- Where do they fall on a scale of technology adoption from early adopter to late adopter?
- How does IT impact their academic experience?

To complete the student study, ECAR collects, analyzes, and reports on both quantitative and qualitative data that profiles undergraduates' use of technology in general and as it pertains to their academic experience. Quantitative data is gathered through a web-based survey of freshman- and senior-year students from four-year institutions and students of any class standing at two-year institutions. The results of our quantitative analyses are supported by qualitative data from focus group interview sessions of students at participating institutions.

Questions about undergraduates' use of IT in and out of their courses as well as perceptions about IT's impact on their academic experience form the core of our annual study. In 2008, ECAR began to incorporate a special focus area—a more in-depth set of questions about a topic of emerging importance to higher education—that changes with each year's study. The focus area for 2008 was social networking, and in 2009 we "dove deep" into mobile communications,

looking at student ownership and use of Internet-capable handheld devices. We are continuing to track the impact of handheld Internet devices in the academic environment by incorporating many of these mobility questions into the core of our survey.

For this year's study, in light of growing interest in "cloud" services as a new model of computing, we chose to look at common web-based tools, many of which can take the place of traditional PC-based applications, and their impact on the academic experience. To do this we returned to many of the questions asked in the 2008 special-focus area, social networking sites, to see if there has been any notable change in usage patterns of these applications. We also added questions to analyze if and how students are using relatively new web-based tools in their courses.

Our goal is to present practical, applicable, and substantiated findings that offer a glimpse into the role IT plays in students' lives as they pursue a college education. Ideally, our research will be of value to numerous constituents in academic settings, particularly when applied in conjunction with other research at the institutional and national levels. It is important to note that while the findings from our student study may provide insight into IT in the undergraduate academic context, they may not be generalizable to larger populations of undergraduates beyond the sample in our survey.

Methodology

The 2010 study builds on and extends previous studies and consists of the following data collection and analytical undertakings.

Literature Review

ECAR performs a literature review each year to identify relevant issues and to support our analyses. We look at scholarly articles, current news stories, and publications relating to technology and higher education; we also explore other relevant surveys of college students. The literature review assesses previous years' research for currency and adds new research as we seek to find the most up-to-date and relevant supporting material about college students and IT. A bibliography of the literature used to corroborate our findings appears in Appendix E.

Web-Based Survey

ECAR conducts a web-based survey to collect quantitative data about undergraduate students' ownership and use of information technologies and their perspectives about IT in the academic environment. This year's survey was based on previous surveys, with a few minor changes to some core questions. In addition, a section was added to include questions about the focus area (student use of web-based tools). A copy of the survey appears in Appendix B.

Survey Design

The 2010 survey consisted of more than 70 questions, including demographic queries and a final open-ended comment. Each question was individually evaluated by ECAR principal investigators for currency and significance and was compared to similar questions in previous years' surveys to preserve consistency for longitudinal comparison wherever possible. ECAR pretested wording of the questions with students at several participating institutions, and functionality testing was performed prior to launching.

Human Subjects Review and Confidentiality

Each year, ECAR invites ECAR-subscribing and other interested institutions to participate in the survey. Institutions wishing to participate must provide approval from their institutional executives and their Institutional Review Board (IRB).[1] The study has been deemed exempt from the full IRB approval processes at the University of Wisconsin–Madison, so we encourage institutions to

use the UW–Madison exemption if possible, though we provide all the necessary information for those institutions that need to use their own full IRB process. FERPA regulations preclude us from surveying students under the age of 18 without parental permission, so we screen respondents by age and allow only those 18 and over to continue into the online survey. The information we collect in the survey is confidential. No data from the quantitative survey is presented that would make it possible to identify a particular respondent, and the data files used for analysis are purged of any information that would have similar consequences.

Survey Administration

Participating BA, MA, and doctoral institutions were asked to sample their freshman and senior students, and AA or two-year institutions were asked to sample their student body without regard to class standing. As in previous years, each university used a different sampling model, and a number of them chose to include their entire freshman and senior classes.

The web-based survey was administered online by EDUCAUSE on a secure file server using Inquisite survey software to collect responses. The survey was administered at 126 U.S., 1 Canadian, and 3 international institutions between February and April 2010. For the purposes of this study, we used only data from the U.S. and Canadian institutions. Because institutional participation was voluntary and participating institutions used varying models to select students to invite, it is important to note that the survey's results can be generalized to the responding students but not necessarily to the entire set of participating institutions.[2]

Student Focus Groups

ECAR collected qualitative data by means of student focus groups at Passaic County Community College, Stevens Institute of Technology, The University of Memphis, and The University of South Dakota. A total of 84 students participated in the focus groups, and each focus group meeting lasted an hour. The focus group interview questions appear in Appendix C.[3]

Student Comments

More than 10,000 students responded to the open-ended survey question to provide more information concerning their views about IT. They expressed opinions on their use of and skill with IT, the state of their institutions' IT support services, their perceptions of technology use in their courses, and their experiences with handheld devices. These comments were not statistically analyzed using a content analysis tool; however, many comments provided additional insight into the substance of the quantitative data, and a few were incorporated into the text of the study.

Longitudinal Analysis

Longitudinal analysis involves comparing responses to similar questions asked in different annual surveys. We began comparing longitudinal data in the student study in 2005, the study's second year. That year, most of the differences were found to be minor and statistically insignificant, but a few were identified as noteworthy. Where questions were consistent, we performed more robust longitudinal analysis of repeated questions in 2006 through 2009.

ECAR originally limited its longitudinal comparisons to only those institutions that participated in all of the years being evaluated, in order to ensure relative comparisons from year to year. During the years we followed this process, we observed that the response percentages reported when comparing year to year for this subset were not meaningfully different from the full population from each year. Therefore, in our 2010 longitudinal analysis we report on the full population of respondents from

each year when we identify a significant statistical relationship or change that merits reporting, rather than the subset of institutions that participated in the current and previous three studies.[4]

Analysis and Reporting Conventions

We observed the following conventions in analyzing and reporting data results:

- Some tables and figures presented in this study include fewer than the total 36,950 respondents from the 126 U.S. institutions and 1 Canadian institution. In this case, they were adjusted for missing information or to reflect a subset of responses as indicated by the table or figure title.
- Percentages in some charts and tables may not add up to exactly 100% due to rounding.
- The Likert scales used in the online surveys are footnoted in the tables and figures showing results for these survey questions.
- We use the term "four-year institution" to refer generally to institutions that award baccalaureate degrees, regardless of whether those are the highest degrees they award. When we break out results by class standing, "freshman" and "senior" always refer to students from four-year institutions who report those class standings, while students from two-year institutions are presented as a single class-standing category.
- Significant associations between survey questions (variables) that were both statistically significant and meaningful are reported in the text and/or supporting figures and tables. Note that a statistically significant relationship between two variables doesn't necessarily indicate a causal relationship.
- Certain combinations of questions in our survey instrument that pertain to technology usage could be answered inconsistently. For example, a respondent might report "never" using a certain technology for school, work, or recreation but then answer "yes" to "Are you using this technology in a course during the course or semester of the survey?" Students might respond this way for a variety of reasons. They might have applied different use thresholds to different questions or given more accurate responses to questions that have a shorter time frame for recall (a common survey issue), or they might simply have marked answers randomly, just to finish the survey. We conduct several checks for inconsistencies to ensure the discrepancies are small, but because we cannot know a student's intention when we analyze these response conflicts, we cannot be sure that they are true errors. Therefore, we do not eliminate or adjust these responses. We point out inconsistencies where they are notable.

Participating Institutions

Because participation in the study is voluntary and each institution chooses its own sampling process, the institutions participating in the study do not represent a statistical representation of U.S. and Canadian higher educational diversity as a whole. However, the 126 U.S. institutions that participated in this year's study do reflect a mix of the different higher education institution types in the United States, in terms of Carnegie class, size of institution, and private versus public status.

For comparison, we grouped institutions using categories derived from the 2000 edition of the *Carnegie Classification of Institutions of Higher Education*, developed by the Carnegie Foundation for the Advancement of Teaching.[5] For our study's statistical and descriptive purposes, we collapsed the Carnegie 2000 classifications as follows:

- Doctoral (DR) institutions group the doctoral-extensive and doctoral-intensive universities together.
- Master's (MA) institutions group master's colleges and universities I and II together.
- Baccalaureate (BA) institutions combine the three Carnegie 2000 baccalaureate groups.
- Associate's (AA) institutions are the same as the Carnegie 2000 associate's category.
- Other Carnegie institutions include specialized institutions and U.S. higher education offices.
- Canadian institutions are tracked in a separate, single category when reporting by Carnegie classification.

Table 3-1 compares the distribution of participating institutions and student survey respondents using the Carnegie class categories described above as well as FTE and institutional control. As in all previous studies, participating institutions are overwhelmingly four-year institutions (100 out of 127 U.S. and Canadian institutions participating). We have, however, seen a steady increase in participating AA institutions over the last few years. This year, 26 AA institutions participated in the study, contributing 12.3% of student responses. The single participating Canadian institution is a two-year institution and is reported as such when comparing four-year with two-year institutions. In 2009, there were 12 AA institutions, accounting for 8.2% of student respondents, and in 2008 there were 8 AA institutions, making up 12.2% of the respondent base. Study responses are also biased toward doctoral institutions (56.3%), larger institutions (71.5% enroll more than 8,000 students), and public institutions (75.2%). Therefore, our study findings should be considered instructive or indicative rather than conclusive of student experiences at different types of institutions.

Table 3-1. Profile of Participating Institutions

	Number of Institutions (N = 127)	Number of Respondents (N = 36,950)	Percentage of Respondents
Carnegie Class			
DR	51	20,794	56.3%
MA	28	8,251	22.3%
BA	18	2,938	8.0%
AA	26	4,262	11.5%
Other	3	408	1.1%
Canada	1	297	0.8%
Student FTE Enrollment			
1–2,000	26	1,903	5.2%
2,001–4,000	17	3,748	10.1%
4,001–8,000	21	4,884	13.2%
8,001–15,000	25	8,664	23.4%
15,001–25,000	23	11,631	31.5%
More than 25,000	15	6,120	16.6%
Control			
Private	52	9,177	24.8%
Public	75	27,773	75.2%

Respondent Characteristics

Invitations to participate in the survey were sent by e-mail to more than 285,000 students—seniors and freshmen at 100 U.S. four-year institutions and general students at 27 U.S. and Canadian two-year institutions (see Appendix D).[6] Figure 3-1 shows the breakdown of respondents' answers to the question "What is your class standing?" The options were "Senior or final year," "Freshman or first year," and "Other." In our data preparation process, students from participating two-year institutions were automatically classified as "two-year-institution student" no matter what option they selected. These constituted 12.3% of all respondents. Although at four-year institutions only seniors and freshmen were invited to participate, well over 1 in 10 of these students responded "other" when asked their class standing; these respondents' understanding of their own standing apparently differed from that of the official institutional record, and they make up 11.4% of all respondents. Freshmen from four-year institutions make up 33.6% of the respondents, and seniors from four-year institutions make up 42.2%. In addition, 170 of the four-year students (0.5% of respondents) did not respond to this question at all.

Student respondents continue to be weighted toward so-called traditional students, as evidenced in the profile in Table 3-2. Most respondents are under 25 years old (77.7%) and go to school full time (85.9%). Freshmen most often live on campus (72.2%), while seniors (80.6%) and students from two-year institutions (95.2%) most often live off campus. Grade point averages for our respondents show 79.3% of respondents having a B or better grade point average. As in past years, female students make up a larger share of respondents (62.5%) than males.

The overall student response rate in the 2010 study is 10.7%.[7] There is significant variation by institution, and the response rate may be affected by a number of factors, including students' growing awareness of malware and computer viruses, making them more cautious about responding to the e-mail invitation. Moreover, students could have survey fatigue, as they receive numerous e-mails throughout the year asking them to take a survey and win a prize.

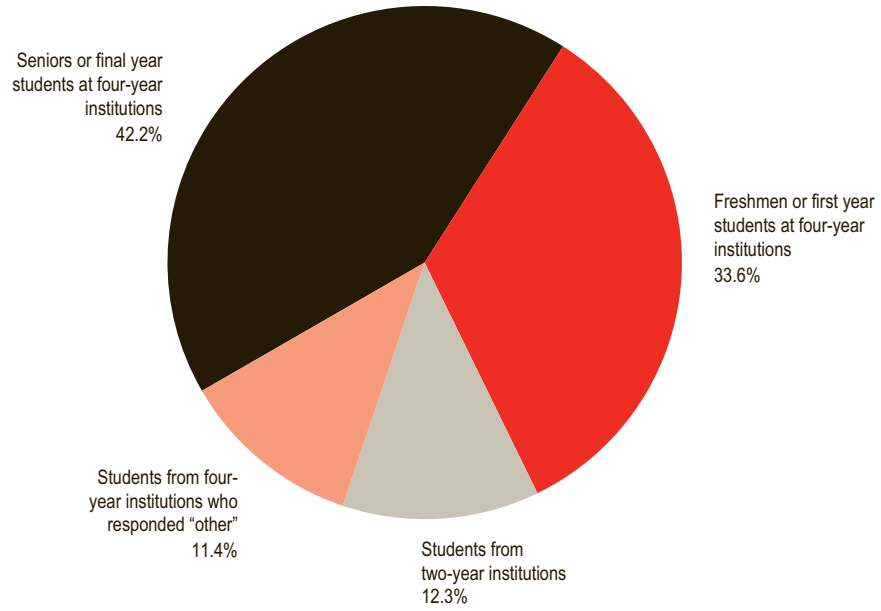


Figure 3-1. Respondent Class Standing (N = 36,780)

Table 3-2. Profile of Student Respondents

	Four-Year Institutions			Two-Year Institutions (N = 4,559)	All Students (N = 36,780)*
	Seniors (N = 15,586)	Freshmen (N = 12,408)	Other (N = 4,227)		
Gender					
Male	39.1%	37.0%	38.5%	31.9%	37.5%
Female	60.9%	63.0%	61.5%	68.1%	62.5%
Age					
18–19	0.4%	91.3%	10.7%	12.6%	33.8%
20–24	75.4%	4.8%	62.3%	25.0%	43.9%
25–29	10.5%	1.3%	9.5%	15.9%	8.0%
30–39	7.0%	1.3%	7.9%	19.9%	6.8%
40–49	4.3%	0.9%	5.5%	16.5%	4.8%
50 and over	2.4%	0.4%	4.0%	10.1%	2.8%
Residence					
On campus	19.4%	72.2%	31.4%	4.8%	36.8%
Off campus	80.6%	27.8%	68.6%	95.2%	63.2%
Full/Part-Time Status					
Full time	86.0%	96.8%	83.4%	58.0%	85.9%
Part time	14.0%	3.2%	16.6%	42.0%	14.1%
GPA					
A	21.1%	17.4%	25.2%	28.8%	21.3%
A-	23.9%	21.5%	23.0%	20.0%	22.5%
B+	20.4%	18.7%	18.4%	16.6%	19.1%
B	17.3%	17.6%	13.6%	12.6%	16.4%
B-	8.5%	8.6%	7.6%	5.2%	8.1%
C+	4.8%	4.6%	4.3%	3.5%	4.5%
C	2.2%	2.9%	2.2%	1.6%	2.4%
C- or lower	0.3%	1.5%	1.0%	0.5%	0.8%
Don't know	1.5%	7.1%	4.8%	11.3%	5.0%

** Among respondents, 170 from four-year institutions did not answer the question about their class standing.*

We also asked students to identify their major from a list of 10 options (see Table 3-3). Note that the total number of responses is larger than the overall number of respondents (N = 36,950) because many respondents reported more than one major (14.3%). More students selected "Other" than any other major category. This is likely due to majors that don't seem to fit the listed major categories. As would be expected, more freshman respondents at four-year institutions say they are undecided (15.7%), as do 6.9% of the mixed-class-standing respondents from two-year institutions.

Research Team

The principal investigators for this year's study are Shannon D. Smith and Judith Borreson Caruso. Joshua Kim, Director of Learning and

Table 3-3. Student Respondents' Majors

Major	N	Percentage
Other	8,030	21.7%
Life/biological sciences, including agriculture and health sciences	6,503	17.6%
Business	5,931	16.1%
Social sciences	5,907	16.0%
Education, including physical education	3,232	8.7%
Humanities	3,219	8.7%
Engineering	3,181	8.6%
Fine arts	2,569	7.0%
Undecided	2,398	6.5%
Physical sciences, including math	1,867	5.1%

Technology at Dartmouth College's Master of Health Care Delivery Science Program, contributed the introduction.

Shannon D. Smith

Shannon D. Smith is a Fellow with ECAR. She began her career in 1983 at Electronic Data Systems and spent 18 years specializing in business intelligence systems for corporate, government, and higher education clients. In 1999, she entered the doctoral program in history at the University of Nebraska–Lincoln and began teaching at Oglala Lakota College on the Pine Ridge Indian Reservation in South Dakota in 2002. As chair of the college's distance learning committee, she advocated for and oversaw the implementation of policies and technologies to deliver online courses. In addition to her research on learning technology and nontraditional students, she has published extensively on Western and American Indian history.

Judith Borreson Caruso

Judith Borreson Caruso is Director of Policy and Planning at the University of Wisconsin–Madison and has been an ECAR Research Fellow since July 2002. She has been in higher education IT roles for 30 years in the areas of application development, data management, policy, and security. Caruso is active in several IT professional organizations, including EDUCAUSE. She has served on the EDUCAUSE Current Issues and *EDUCAUSE Quarterly* editorial committees. Currently, she serves on the executive committee of the University of Wisconsin System IT Management Council. While with ECAR, she participated in the enterprise resource planning (ERP), IT security, and student studies.

Joshua Kim

Joshua Kim is an ECAR Fellow and Director of Learning and Technology for the Master of Health Care Delivery Science Program at Dartmouth College. His expertise is in instructional design and technology-enhanced course development. He has also taught in the Department of Sociology and has a PhD from Brown University. He writes a popular blog at http://www.insidehighered.com/blogs/technology_and_learning and can be followed on Twitter at twitter.com/joshmkim.

Endnotes

1. Each institution required approvals from institutional executives and their IRB in order to participate in the study. The approval processes, while navigated by an institutional contact, varied considerably in difficulty from institution to institution. Often, the information required for approval was different from one institution to the next. While the investigators made every attempt to provide all information required at

the start of the study solicitation, additional details were added throughout the approval process to provide what each institution required. The IRB applications, application dates, and approval dates are available from ECAR.

2. In addition to potential sampling errors, there are other potential sources of error that are non-sample related, such as the wording of the survey questions (may not be clear) and most notably nonrepresentative responses (a substantial percentage of the students invited to take this survey declined to do so). Since the response rates in this study were lower than hoped for at a number of institutions, one cannot be certain of how representative the respondents are of their respective institutions or of this population in general. Therefore, caution should be exercised in assuming that the findings generalize beyond the sampled students.
3. Staff from participating institutions used a variety of methods to recruit students—posting advertisements in various campus locations, making announcements in large-enrollment classes, and e-mailing students. Food and beverages were provided as incentives to attend. Students who work in general-access undergraduate student computing laboratories or for student technology help desks were also included in the focus groups. Students were advised of IRB regulations that govern the research and their rights and the responsibility of the investigators to protect their rights. Notes were taken. None of the comments made by students and cited in this study identify any individual student. In some instances, we corrected their grammar or local vernacular but made no change in meaning.
4. Forty-four institutions participated in the 2007, 2008, 2009, and 2010 studies. ECAR compares institution and student respondent demographics across reporting years to ensure no factors other than time create reportable changes from year to year. So far, we have seen no significant changes in the age, gender, and institutional makeup of the respondents to our survey from one year to the next. If we were to find a statistically significant change in participating institution and/or respondent demographics from previous years, we would evaluate and note any potential impact on our longitudinal findings.
5. Alexander C. McCormick, *The Carnegie Classification of Institutions of Higher Education*, 2000 Edition (Menlo Park, CA: The Carnegie Foundation for the Advancement of Teaching, 2000).
6. To encourage a larger response from the students, ECAR offered 99 $50 and $100 gift certificates to be awarded to students, using a lottery.
7. Several participating institutions did not provide enrollment and sample information, so these data were not included in the calculation for overall response rate.

4
Technology Adoption and Ownership of IT

I am likely one of the least technologically advanced members of my generation. I don't have cable TV, I was the last of my friends to get a cell phone, and also the last to upgrade to a smartphone. I did not have Internet access at home until two years ago, and have never owned an MP3 player, iPod, or any other similar device. I hope I do not skew your data!

—An undergraduate student

Key Findings

- Since 2006, about half of our survey respondents have said they "usually use new technologies when most people I know do," which we categorize as mainstream technology adopters. Fewer fall at the ends of the spectrum, saying that they are skeptical or one of the last people they know to use new technologies (laggards or late adopters) or that they are among the first or usually use them before most people they know (innovators or early adopters).
- Female respondents have consistently assessed themselves lower on this technology adoption scale since we started asking. This year, half of male respondents indicated they were innovators or early adopters, versus just a quarter of female respondents.
- About half of respondents agreed or strongly agreed with the statement "When I entered college, I was adequately prepared to use IT as needed in my courses." Just under a quarter disagreed or strongly disagreed, and another quarter were neutral.
- The composition of technology owned by students continues moving toward mobility, as more than 8 out of 10 respondents own a full-size laptop computer, while only half own a desktop.
- Slightly more than 1 in 10 respondents own a netbook computer, and only 3% own a dedicated e-book reader.
- Nearly all respondents (99%) own at least one computer, and more than a third own more than one.
- More than half say their newest computer, whether laptop, netbook, or desktop, is one year old or less, and 7 out of 10 own a machine two years old or less. Students from two-year institutions own proportionately more desktops and proportionately fewer laptops than respondents from four-year institutions.
- On average, respondents report spending 21.2 hours per week on the Internet for school, work, or recreation activities.
- Almost two-thirds of respondents own an Internet-capable handheld device.
- Among owners of Internet-capable handheld devices, in 2010, 43% report using the Internet daily, compared with 29% in 2009.

There are more than 18 million undergraduate college students in the United States today, and most of them come to campus with powerful computers in their pockets, purses, or backpacks. Portable devices such as laptops, netbooks, and smartphones have

as much or more computing power than the typical desktop computer 10 years ago. Throw in e-book readers, electronic tablets, and handheld gaming and music devices with wireless Internet access and the average college student can do as much or more today while sitting in a coffee shop than such a student could have done a few years ago in the school's computer lab or library. The rapid pace of technological advancement makes it difficult to determine how IT-savvy students are compared with their counterparts from previous years. A large percentage of today's incoming freshmen do not think twice about using their mobile phone to view the latest viral YouTube video or to send a text message embedded with freshly taken photos to friends across the room or across the globe. But many of this year's seniors probably thought these functions were cost-prohibitive and reserved for the technically advanced stereotypical computer geek when they entered school four years ago.

The relentless pace of such change makes determining how proficient students are with IT a difficult endeavor, but it is clear that now, more than ever, students must use a considerable amount of IT in order to get the most out of their college experience. Students apply to their institution, register for classes, pay their tuition, and keep up with their school's athletic teams online. They must navigate electronic databases in search of scholarly material and use a course management system to submit assignments, monitor their grades, and communicate with faculty. In "The Digital Identity Divide: How Technology Knowledge Impacts College Students," Joanna Goode writes, "Knowing how to utilize the technological ecosystem of university life is certainly critical for academic success." However, Goode concludes "there are rarely explicit technology prerequisites for college entrance, resulting in a range of student technology knowledge among the student population."[1] Indeed, our research finds that college students are as diverse in their ownership and use of IT and opinions of their own technical skills as they are in the many other characteristics that experts analyze when attempting to define the "typical" college student.

Exploring the range of students' technology skills and perceptions is one of the goals of the ECAR study of undergraduates and IT. This is our seventh year of the study, and it continues to reveal remarkable changes and surprising consistency in students' ownership, expertise, and opinions regarding the use of IT that has occurred during this short period. In this chapter, we explore student respondents' technology adoption practices as related to their ownership and use of computers and mobile devices. In subsequent chapters, we look more closely at respondents' IT activities, their perceived skill levels with various technologies, and their use of technology in the academic environment.

Student Technology Adoption Trends

How individuals decide to adopt a particular technology and the time frame involved has been a subject of research for many years. The technology adoption process affects many aspects of everyday life and has become increasingly more important in higher education as technology literacy is integrated into every facet of the college experience. Since 2006, ECAR has studied undergraduates' technology adoption practices using a scale developed by Everett Rogers and published in his 1962 book *Diffusion of Innovations*.[2] Rogers's framework proposes five categories of adopters—innovators, early adopters, early majority, late majority, and laggards—typically illustrated as a bell curve distribution. Subsequent research employing innovator-to-laggard models has found that adopting and engaging with new technology is associated with many factors, including cultural influences, financial capa-

bility, perceived difficulty versus perceived benefits, past experience with new technology, and gender.[3]

In our student survey, respondents were given a set of statements about technology adoption and asked to choose the one that best described them. ECAR then mapped their responses into an adapted Rogers technology adoption model (see Table 4-1). Over the years, we have found that student responses about technology adoption are often associated with their use and experience with IT both generally and in the academic context.

Every year that we have asked these questions, overall student responses have distributed into a rough bell curve, and this year is no different: about half (49.3%) of all respondents identify themselves as mainstream adopters (see Figure 4-1), while the percentages drop off for earlier and later adoption categories. This pattern has been complicated, however, by a persistent gender difference, and once again this year about half of the male respondents see themselves as innovators or early adopters (52.0%), while just a quarter of females (25.6%) choose these categories.

Table 4-1. Technology Adoption Categories

Which best describes you?	ECAR Descriptor
I am skeptical of new technologies and use them only when I have to.	Laggard
I am usually one of the last people I know to use new technologies.	Late adopter
I usually use new technologies when most people I know do.	Mainstream adopter
I like new technologies and use them before most people I know.	Early adopter
I love new technologies and am among the first to experiment with and use them.	Innovator

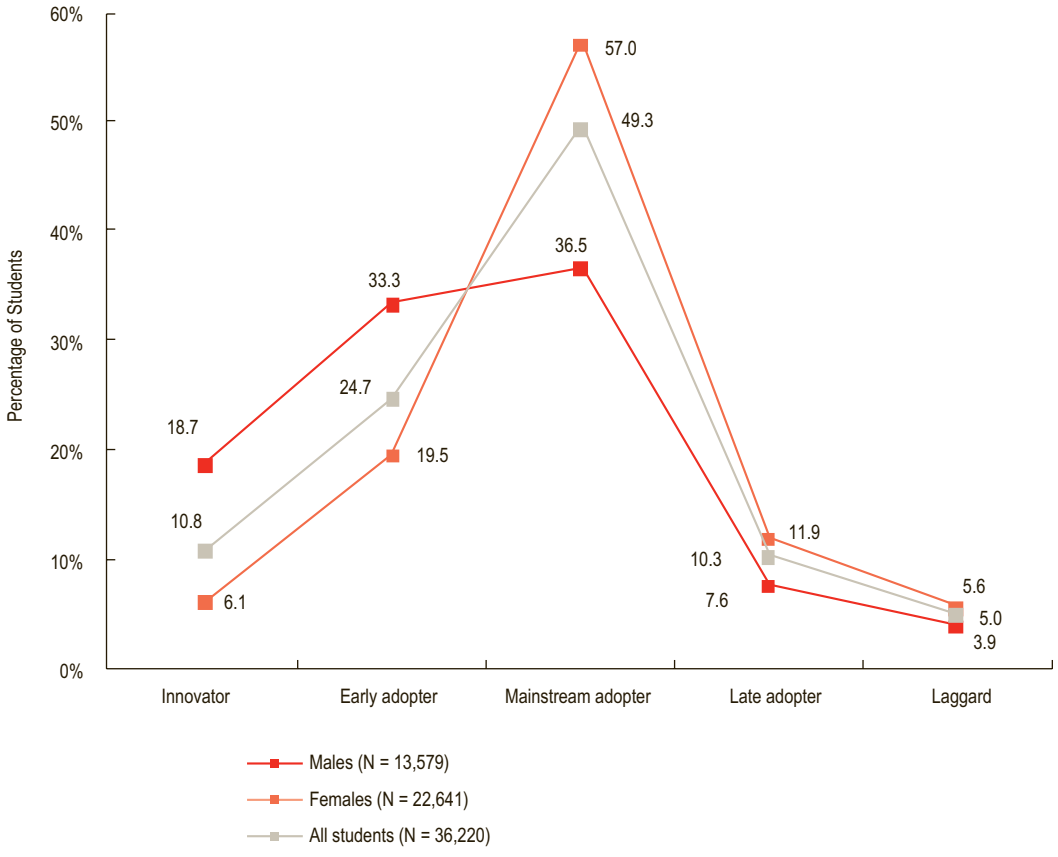


Figure 4-1. Respondent Technology Adoption, by Gender and Overall

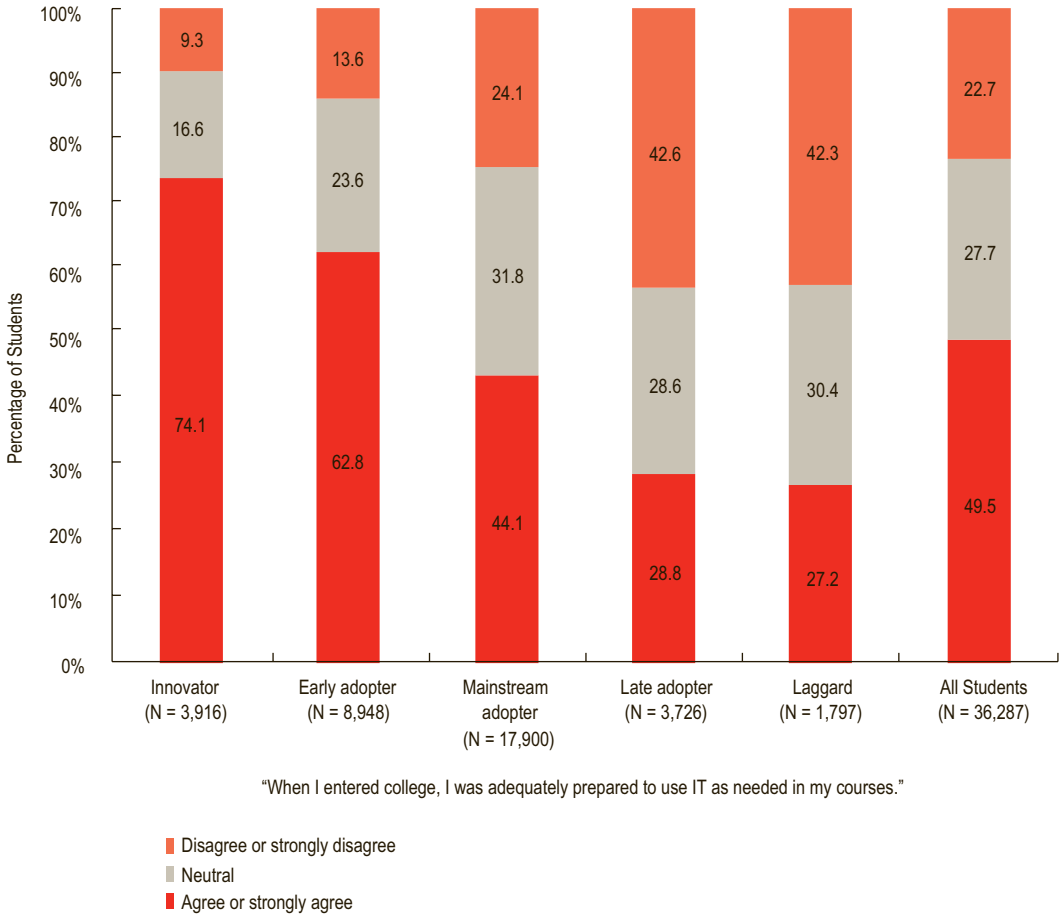
The influence of gender on new technology adoption has received a significant amount of attention. A few studies claim the gender gap is lessening as more people are exposed to and using technology, but most research supports the idea that social influences play a much stronger role in technology adoption for females than males. Men appear to be more strongly influenced by their own attitudes toward using new technology, while women's decisions tend to be driven by their perception of others' beliefs that they should or should not adopt—findings that are consistent across income, education, and computer self-efficacy levels.[4] The ECAR technology adoption results are also potentially influenced by the tendency of women to assess their technical skills lower than men, as other research has found.[5]

Preparedness for College-Level IT

Our technology adoption scale is associated with many other items that we asked about, as we'll note in several sections of this study. For instance, this year we asked students for the first time whether respondents agreed with the statement "When I entered college, I was adequately prepared to use IT as needed in my courses." We found that their technology adoption profile had a significant influence on their opinion (see Figure 4-2). Half (49.5%) of respondents overall agreed or strongly agreed.

However, almost three-quarters of innovators (74.1%) agreed or strongly agreed, versus just over one-quarter of the students who categorized themselves as laggards (27.2%). Mainstream adopters, who constitute about half of all respondents, also indicated they

Figure 4-2. Preparedness for College-Level IT, by Technology Adoption



may have reservations about their technological preparedness, as nearly a quarter (24.1%) disagreed or strongly disagreed with the statement.

Because knowledge of and comfort with technology are implicitly required for both college and future career success, Goode, an expert on how technology mediates the educational experiences of high school and university students, proposes a reconceptualization of how to study the varying factors that create a potential digital divide. Concurring with the many studies showing that gender and other socioeconomic factors play a part in creating disparities in technology access and technology knowledge, Goode suggests that students come to college with a "technology identity" that creates both academic opportunities and obstacles because their previous relationship with technology tends to be reinforced by their university. Those who identified themselves as fluent and excited or even infatuated with technology continued to feel this way when they entered college. Unfortunately, those whose technology identity was shaped by feeling challenged or not fluent due to lack of access struggled to overcome their shortcomings.

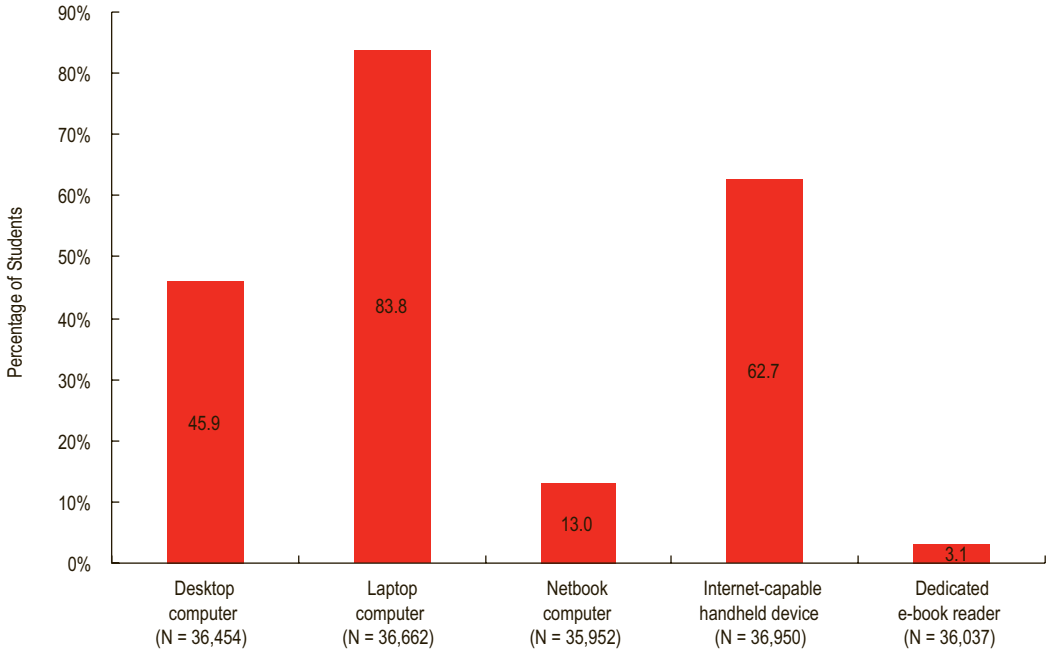
"For many college students," says Goode, "not having a strong technology identity is a product of an unequal high school education and disparities in home resources, yet the consequences of one's technology identity have a powerful influence on the attitudes and decisions students make regarding their academic and life plans." Goode says the positive news is that the dynamic nature of a technology identity allows for beliefs to shift over time as students gain new life experiences, particularly if universities offer adequate technology support services.[6] Our findings on technology adoption and preparedness for college-level IT do not address respondents' prior experiences with technology in high school or at work, but the fact that almost a quarter of respondents (22.7%) did not agree with the statement about preparedness suggests that institutions should develop strategies to identify and nurture these students. If Goode is correct in her assertion that technology identities can shift over time, institutional efforts to intervene with those students could enable them to catch up to their peers and improve their overall college experience.

Technology Ownership

Since we began this study in 2004, ECAR has found that computers are omnipresent on campus and prevalent at home, but the mix of computer equipment student respondents tell us they own has changed along with the rapidly changing technology available to them. In 2004, we asked respondents if they owned a desktop (62.8%), a laptop (46.8%), a PDA (11.9%), a "cell or digital phone" (82.0%), or a smartphone (1.1%), which we defined as a "combination cell phone and PDA device."[7] Over the next five years the equipment we asked about changed as the mobility of newer, smaller, faster devices came at less of a premium and moved through the technology adoption cycle from innovator to mainstream to laggard. Ubiquity of ownership or convergence of many of the devices caused some of them to fall off our list and affected our definitions over time.

In 2009 and this year, we asked students if they owned "a handheld device that is capable of accessing the Internet (whether or not you use that capability)" and gave as examples the "iPhone, Treo, BlackBerry, other Internet-capable cell phone, iPod touch, PDA, Pocket PC, etc."[8] (In this study we refer to these as "Internet-capable handheld devices" or "handheld devices.") Just under two-thirds of respondents (62.7%) indicated that they owned one, although the number may actually be a little higher because some respondents told us they weren't sure whether their handheld devices were capable of accessing the Internet (see Figure 4-3).

Figure 4-3. Overview of Technology Ownership



This year, in addition to asking whether students owned Internet-capable handheld devices, we also asked about personal dedicated e-book readers such as the Amazon Kindle, Sony Reader, Barnes & Noble nook, etc., and clarified that this category did not include iPhones or other devices whose primary function is not as an e-book reader. We continued asking questions from past surveys by asking about desktop computers, but we separated laptops into two categories: a personal full-sized laptop computer and a personal small, lightweight netbook computer. As could be expected, we found that the composition of technology owned by students continues moving toward mobility.

It is not surprising that so few students tell us they own e-book readers (3.1%). Several university pilot programs with different e-book readers have revealed functionality issues such as battery life, inability to quickly note or highlight text, clumsy book navigation, and complex copyright and digital rights management (DRM) technology as stumbling blocks for effective use in the academic environment.[9] Unlike the physical book it is attempting to replicate, it is nearly impossible to share an e-book with someone, even if for just a few days. Expressing anger at the restraints that publishers put on their e-books, one student commented in the open-ended question at the end our survey, "I despise e-books that have DRM on them, especially when I lose access to them at some point… they are scams."

Of course, by the time you read this study, the newborn gorilla in this market may have achieved its proverbial 800-pound size. On May 3, 2010, Apple announced that it sold its one-millionth iPad just 28 days after its introduction, and iPad users had already downloaded more than 12 million apps as well as more than 1.5 million e-books from the new iBookstore. In comparison, about 2.5 million e-readers were sold in all of 2009.[10] Barely two months after Apple's impressive launch, students with iPads already had an impact on campuses around the country. Several schools found that iPads had problems connecting to their networks, and more than a few universities expressed concern about potential bandwidth issues as more and more of these devices show up in students' backpacks.[11] Though the iPad was released

after we placed our survey in the field, a few students commented in open-ended responses that they were eager to use them. One student wrote, "Wish I had an iPad for textbooks … but it's cost-prohibitive right now!" Another wrote, "Since the new iPad was just released by Apple, courses should start to be able to be accessed on them." It is too soon to say just how great an effect the iPad and other similar devices will have on higher education, but it seems likely we will need to adjust our survey questions in the coming years to find out.

Desktops, Laptops, and Netbooks

The type, age, and numbers of computers owned by students have shifted during the years ECAR has conducted the student study. In 2004, 93.4% of respondents owned either a desktop or a laptop computer. This year, 98.6% owned at least one desktop, laptop, or netbook computer, and more than a third told us they owned more than one of these types of computers (see Figure 4-4). Desktop ownership declined by more than 25 percentage points from 2006 to 2009, while laptop ownership increased by nearly as many points.[12] We find about the same percentage of ownership of desktops among all respondents this year (45.9%) as last year (45.8%); however, a lower percentage of respondents told us they owned laptops this year (83.8%) than last year (87.8%). This difference may be explained by the fact that in 2010 we distinguished for the first time between "full-sized" laptops and "small, lightweight" netbooks. This year, 89.3% own either a laptop or a netbook, which may be a more comparable number to last year's percentage of students who said they owned laptops.

Last year we speculated that if student PC ownership reflected industry trends in desktop sales globally, the appearance of inexpensive netbooks might fuel the ongoing decline in desktop ownership by lowering the overall price premium for portable computers. Many experts were saying the economic downturn was "kicking the desktop PC industry while it's down" and that netbooks would likely cannibalize both the desktop and full-sized laptop markets.[13] That may be the case for laptops, but our findings reflect a leveling-out of desktop ownership. Over the last four years, while overall desktop ownership gradually declined, the percentage of students who own a desktop one year old or less has not declined to the same degree. A fairly stable

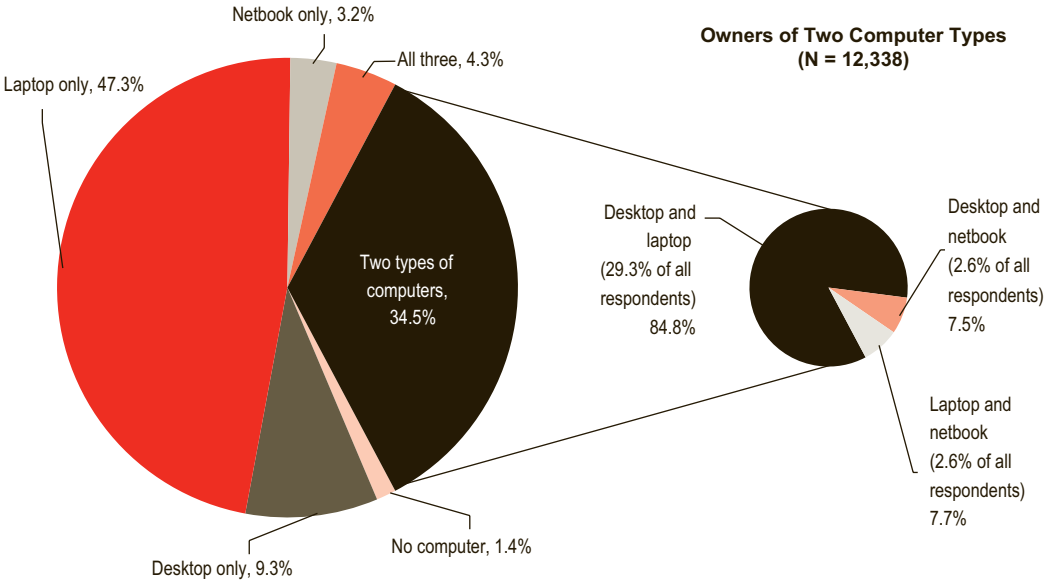


Figure 4-4. Types of Computers Owned (N = 35,755)

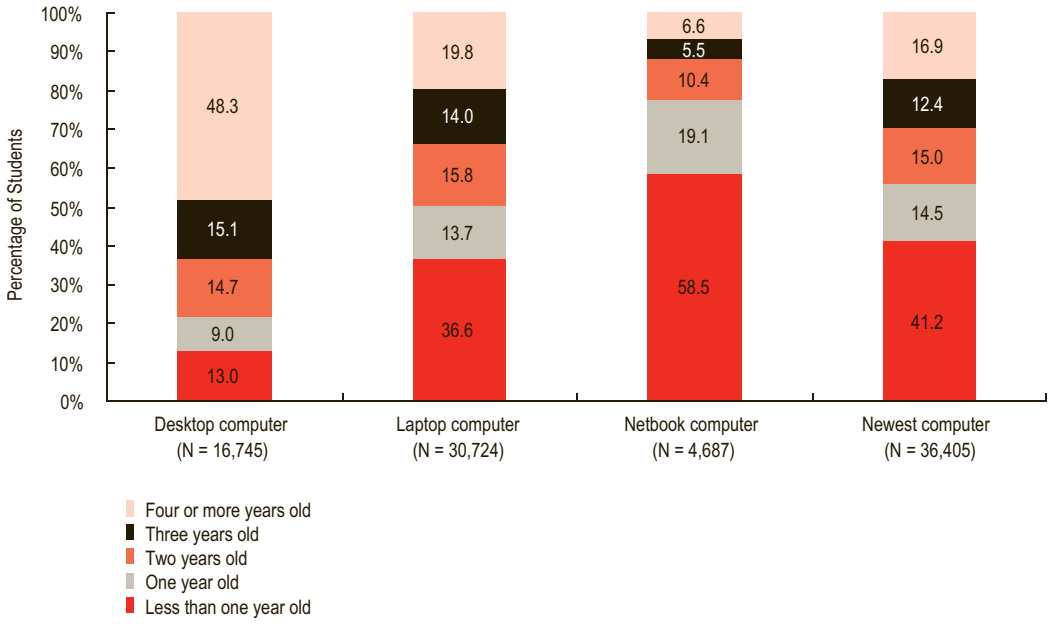
percentage of students own newer desktops: of the respondents who owned them last year, 19.2% had a desktop that they said was a year old or newer, compared with 22.0% of those who own them this year (see Figure 4-5).

As in previous years, IT administrators concerned about supporting obsolete student equipment can take comfort in the relatively up-to-date profile of computer ownership. More than half (55.7%) of respondents say their newest computer, whether laptop, netbook, or desktop, is one year old or less, and 7 out of 10 (70.7%) report owning a machine two years old or less. However, many respondents own older computers, including 16.9% whose newest computer is four years old or older, and nearly half of desktops owned (48.3%) are four or more years old.

We have observed some fairly consistent demographic characteristics when looking at computer ownership over the years. For instance, in this year's responses, while we find no meaningful difference between freshman and senior respondents regarding their ownership of desktops, proportionately more students from two-year institutions told us they owned desktops than did respondents from four-year institutions (see Figure 4-6). More than two-thirds (68.7%) of the two-year respondents own desktops, including more than half (52.9%) who say that those desktops are two or more years old (this equates to 78.3% of desktop owners at two-year institutions). In addition, at four-year institutions, substantially more students who live off campus own desktops (50.6%) than do those living on campus (31.2%). Overall, male respondents are slightly more likely to own desktops (53.4%) than are female respondents (41.4%).

As would be expected, freshmen are more likely than seniors or students from two-year institutions to own new laptops (less than one year old). We find no meaningful difference between males and females. Three out of 10 respondents from two-year institutions do not own a laptop (30.9%), and more than a third (36.0%) say they have a laptop that is two or more years old. While 84.2% of senior respondents own laptops, these machines, as would be expected, are older: more than half of all seniors (58.3%) own laptops that are two or more years old. Netbooks are so uniformly rare that there is no meaningful variation in ownership by other factors.

Figure 4-5. Age of Computers Owned by Students



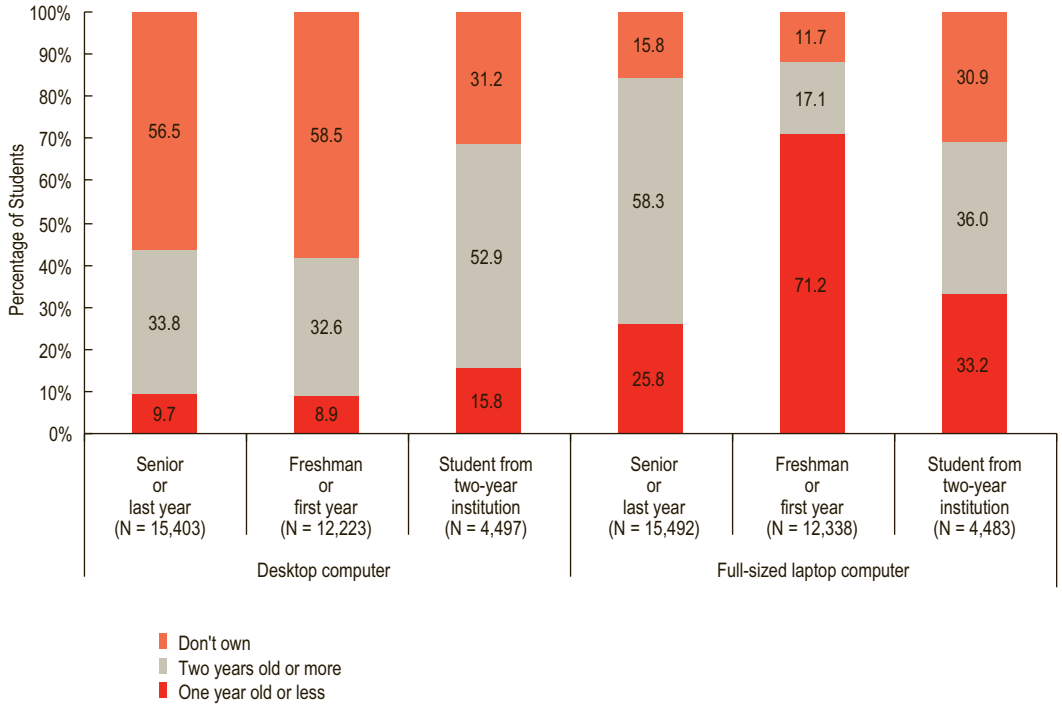


Figure 4-6. Age of Desktop and Laptop Computers, by Class Standing

Industry experts concur that netbooks have cannibalized laptop sales to a degree, but many say that Apple's iPad will have a more significant impact on both netbooks and laptops. While few iPad owners are purchasing them to replace their traditional computer, sales of netbooks, priced from $200 to $500, slowed markedly in the first quarter of 2010, and most attribute this decline to the launch of the iPad.[14] Indeed, our data seems to indicate that netbooks have not caught on in significant numbers among college students (refer to Figure 4-3). It will take several more years of tracking to determine the ultimate fate of the desktop, laptop, netbook, and iPad or tablet PC market and how that plays out on campus. If the relatively slow integration of netbooks and e-book readers into the undergraduate experience is any indication, students are resisting industry marketing and may be healthily skeptical of these newer devices.

Ownership of Internet-Capable Handheld Devices

In the 2009 ECAR student study, we focused on student ownership of Internet-capable handheld devices and found that these devices already had an impact on campus, a fact that anyone walking through the student union could likely corroborate. About half of last year's respondents (51.2%) owned an Internet-capable handheld device, and another 11.8% told us they planned to purchase one in the next 12 months. Not surprisingly, we found ownership of Internet-capable handheld devices continued to grow this year as nearly two-thirds (62.7%) own one, and demand does not appear to be weakening. More than 11% still say they intend to purchase one in the next 12 months (see Figure 4-7).

Many possible factors influence the likelihood of owning an Internet-capable handheld device, such as price of the device, being locked into an existing cell phone contract, or not finding a need for the functionality; but it appears some barriers to ownership are falling. Last year, more than a third of respondents (35.5%) told us they did not own an Internet-capable handheld device and did not plan to purchase one in the next 12 months, whereas just a quarter of this year's students (24.6%) responded this way.

If college students follow global trends, we can anticipate even more growth in Internet-capable handheld device ownership and use over the next few years as the perceived cost-benefit improves. According to International Data Corporation (IDC), growth of the worldwide converged mobile device market (commonly referred to as smartphones, a segment of what we classify as Internet-capable handheld devices) more than doubled that of the overall mobile phone market in the first quarter of 2010. More growth is expected as a result of greater awareness, increasingly affordable data plans, and the global economic recovery.[15]

Technology adoption (refer to Table 4-1) is a factor in device ownership: those who own, or plan to purchase, an Internet-capable handheld device are somewhat more likely to be early adopters and innovators than those who do not own or plan to own a device (see Figure 4-8). However, we are seeing a shift

Figure 4-7. Ownership of Internet-Capable Handheld Device, 2009 and 2010

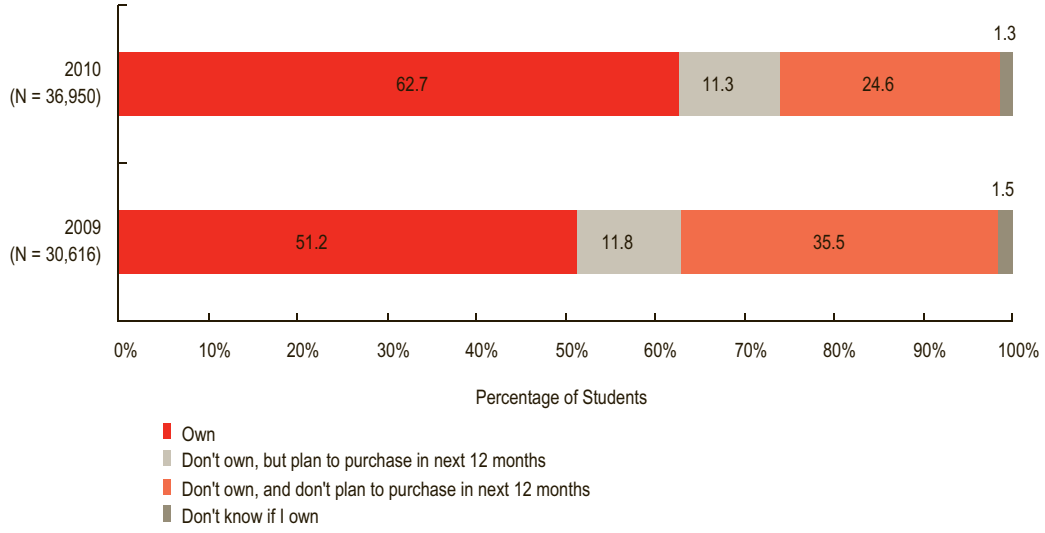
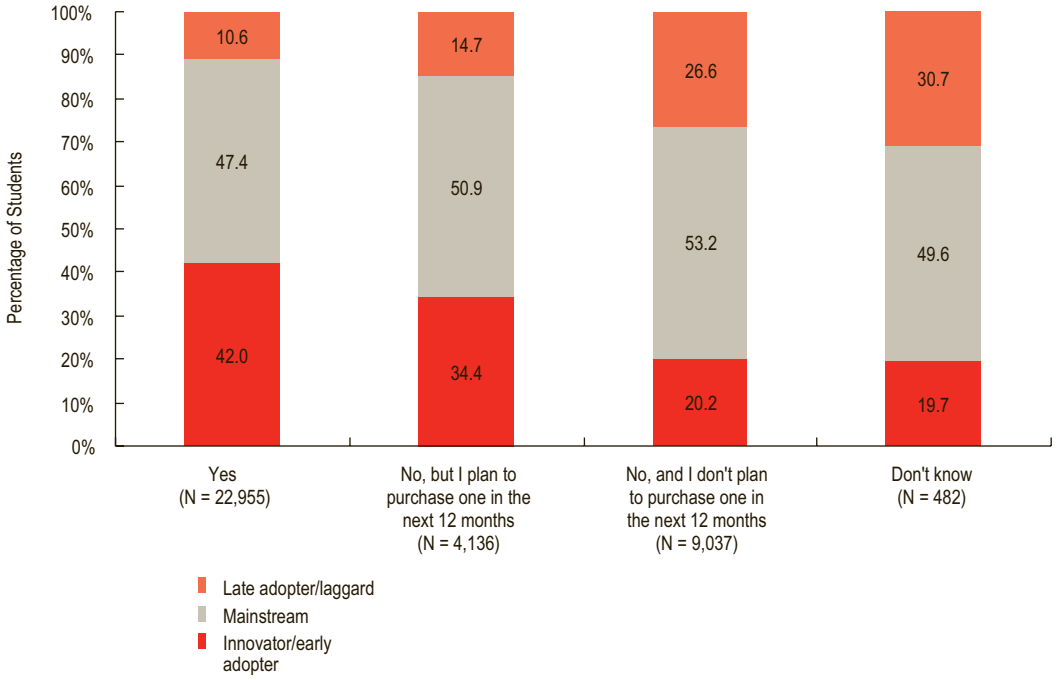


Figure 4-8. Ownership of Internet-Capable Handheld Device, by Technology Adoption



as the students who said they didn't own but planned to purchase an Internet-capable handheld device within the next 12 months were slightly more likely to be early adopters or innovators last year (41.6%) than this year (34.4%). Correspondingly, there was a larger percentage of students who identified as late adopters or laggards among those who said they didn't own and didn't plan to purchase in this year's responses (26.6%) versus last year's (18.9%), perhaps indicating that the population of students we are surveying is moving fairly rapidly through the adoption cycle of these devices.

Our findings may be supported by research from the Nielsen Company, which, like IDC, projects very strong growth in smartphones. Just under half of respondents to a Nielsen survey indicated that their next mobile phone will be a smartphone, and Nielsen believes that continued falling prices and increasing capabilities of these devices along with an explosion of applications have created the beginning of a groundswell. According to Nielsen, this increase will be so rapid that by the end of 2011 there will be more smartphones in the U.S. market than feature phones.[16]

Interestingly, more than 7 of 10 who don't own and don't plan to own an Internet-capable handheld device in the next 12 months view themselves as mainstream or early adopters, but the data reveal no demographic associations, including age, that distinguish this group. It may be that these students still feel that there are plenty of other ways to access the Internet or the costs are still prohibitive for them. Or, we may find this group continuing to shrink if the groundswell of smartphone ownership that is predicted by industry experts comes to fruition.

Hours Online

Respondents vary widely in how much time they spend each week actively doing Internet activities for school, work, and recreation (see Figure 4-9). About a third (32.7%) are online 10 hours or less each week, and the same percentage (32.7%) report spending 11 to 20 hours per week online. At the high end of time spent online, 9.1% of respondents spend more than 40 hours per week on the Internet. The overall mean of time spent actively on the Internet is 21.2 hours per week, while the median is 16 hours per week for this year's respondents.[17] In the responses to the survey's open-ended question, a few students expressed concern about the amount of time they spend online for both school and nonschool activities. One wrote, "While I enjoy using IT, I also feel that I spend too much time

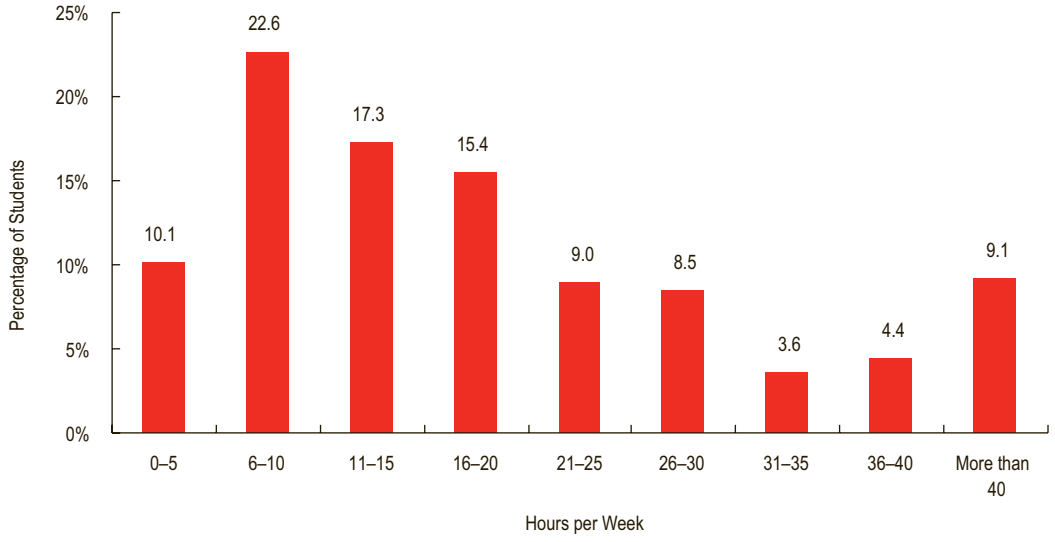


Figure 4-9. Hours per Week Actively Doing Internet Activities for School, Work, and Recreation (N = 28,413)

online, and that negatively affects my mental health; but it is difficult to decrease my usage because of school." Another had a similar sentiment: "My experience is that IT outside of courses is highly distracting, and I often end up getting more stressed out than I need to because I wasted too much time online."

Table 4-2 reveals differences in the amount of time spent per week using the Internet for the majors students reported in our survey. Engineering majors indicated they spend the most time online, with a mean of almost 25 hours per week; education majors reported a mean of just over 18 hours per week. We found no significant differences in online hours based on class standing, GPA, age, or gender.

Respondents who identify themselves as early adopters or innovators spend more time actively doing Internet activities than those who identify themselves as late adopters or laggards (see Table 4-3). While our technology adoption framework does not measure respondents' comfort or skill with technology, it stands to reason that the time spent using technology is related to an individual's comfort with using it. This is supported by other research studies that have found that the amount of time and experience using a computer has a direct positive relationship with an individual's self-perceived experience and promotes a more positive attitude toward technology.[18]

Frequency of Using the Internet from a Handheld Device

Corresponding with the growth in worldwide smartphone ownership, Internet access via handheld devices is growing. According to the online audience measurement service

Table 4-2. Hours per Week Actively Doing Internet Activities, by Major

Major	N	Mean Hours per Week	Median Hours per Week	Std. Deviation
Engineering	2,504	24.6	20	20.19
Physical sciences, including math	1,467	23.5	20	19.22
Fine arts	1,917	22.1	18	19.63
Business	4,631	21.9	17	18.68
Social sciences	4,544	21.9	18	18.12
Humanities	2,402	21.8	18	16.66
Life/biological sciences, including agriculture and health sciences	5,062	19.7	15	16.75
Education, including physical education	2,454	18.1	15	15.70
Total (includes "undecided" and "other" responses)	**28,413**	**21.2**	**15**	**18.37**

Table 4-3. Hours per Week Actively Doing Internet Activities, by Technology Adoption

Technology Adoption Category	N	Mean Hours per Week	Median Hours per Week	Std. Deviation
Laggard	1,348	17.1	12	16.57
Late Adopter	2,906	17.6	14	15.86
Mainstream Adopter	13,963	19.8	15	16.20
Early Adopter	6,995	23.4	20	19.34
Innovator	2,964	28.4	20	24.84
Total	**28,176**	**21.2**	**16**	**18.35**

comScore, in an average month during the period from December 2009 through February 2010, browsers were used by 29.4% of U.S. mobile subscribers, up 2.4 percentage points from the previous three-month period, and 27.5% of subscribers used downloaded applications (up 1.8 percentage points over the same period). Much of this growth was driven by increasing mobile access of social networking sites or blogs, up 2.9 percentage points to 18.0% of mobile subscribers.[19]

ECAR findings seem to reflect this rapid growth in use of the mobile Internet. When we asked students who owned Internet-capable handheld devices this year how often they used their device to access the Internet, two-thirds (66.6%) told us they access it weekly or more often, and more than 4 in 10 (42.6%) said they use it daily, compared with just half (49.5%) who used it weekly or more often and 29.0% who used it daily in 2009 (see Figure 4-10). We also found a drop in the percentage of device owners who said they never use the Internet from their device even though it has the capability (35.4% in 2009 versus 22.1% in 2010).

As with ownership of Internet-capable handheld devices (refer to Figure 4-8), technology adoption is associated with time spent using the Internet from a handheld device. Those who use the Internet from their handheld device daily are more likely to be early adopters or innovators than are those reporting less frequent use. A majority of those who report using the Internet weekly or less often are mainstream adopters, and those who say they never use the Internet capability had the highest proportion of laggards and late adopters of all the use frequency categories.

While these ownership and use numbers appear poised to continue to grow, it is important to note that in 2010 about a quarter of respondents (24.6%) neither owned nor planned to purchase a handheld device in the next 12 months, and 22.1% of those who do own a device never access the Internet with it (refer to Figure 4-7 and Figure 4-10). We are unable to tell whether cost, perceived lack of benefits, or other reasons are preventing these students from accessing the mobile Internet. Other than technology adoption, we found no common demographic or other characteristic of these nonusers, including the number of hours they spend on the Internet or the age or type of their other equipment. It may be that these students are part of the group identified by the Pew Internet & American Life Project as Americans who do not feel, or have yet to feel, the "pull of mobility" into the digital world.[20]

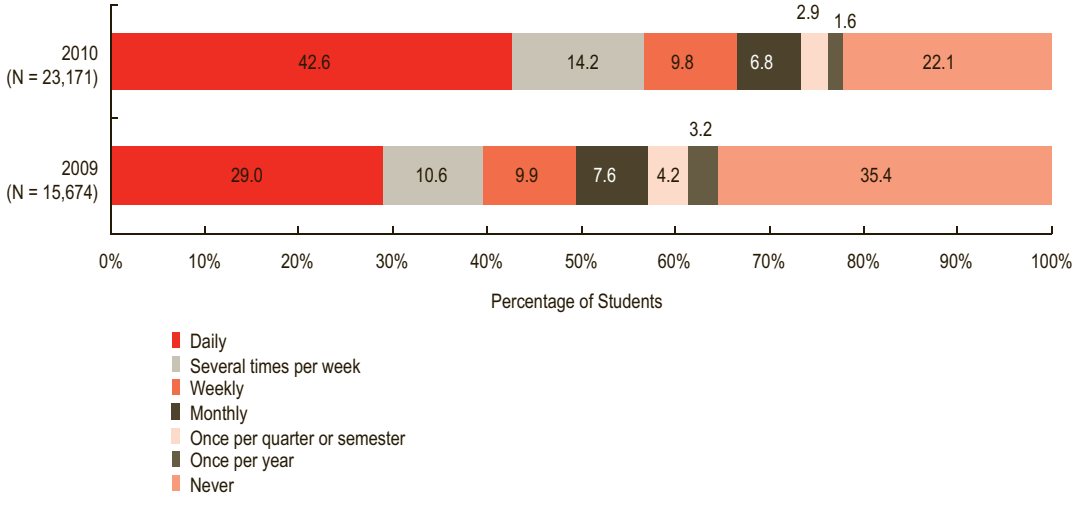


Figure 4-10. Frequency of Using the Internet from Handheld Device, 2009 and 2010*

** Includes only respondents who own an Internet-capable handheld device.*

The Changing Portrait of Student Mobility

Like the rest of the world, students are becoming more and more invested—financially and personally—in using the Internet from handheld devices. In July 2009, Apple announced that customers had downloaded more than 1.5 billion applications from the company's App Store during its first year, and as previously discussed, nine months later the company sold more than 1 million iPads in less than 30 days, adding even more potential App Store customers.[21] This extraordinary growth in mobile Internet technology is expected to continue. According to a report issued by Morgan Stanley in December 2009, the mobile Internet is ramping up significantly faster than desktop Internet did, and they believe more users may connect to the Internet via mobile devices than through desktop PCs within five years.[22]

What does this mean to higher education? Last year's ECAR study *Spreading the Word: Messaging and Communications in Higher Education*, based on survey data from mid-2008, found only half of respondent institutions reporting they had adapted any preexisting web-based services for mobile services, and 6 in 10 said they had developed no new services.[23] Our research indicates significant growth in undergraduate ownership and use of handheld devices to access the Internet, and campus IT departments should be preparing for this rising tide of mobile-Internet-using students—and their rapid pace of adoption.

Last year we observed that students were moving into the mobile Internet in complex, nuanced ways and identified four emerging types of student adopters of the mobile Internet, as shown in Figure 4-11:

- power users who owned and used their devices to access the Internet weekly or more often,
- occasional users who owned devices but used them to access the Internet monthly or less frequently,
- potential users who owned but didn't use their device or did not own a device but planned to purchase one in the next 12 months, and
- nonusers who did not own a device or plan to purchase one in the next 12 months.

The mix of user types among this year's respondents shows that students are adopting the mobile Internet in ways that we would expect for a maturing technology. Figure 4-11 indicates an increase in power users and a decrease in nonusers from 2009 to 2010, demonstrating the progress of these devices through the technology adoption cycle.

Looking at these user types by their overall level of technology adoption supports this idea, as the percentage of power users who identify themselves as innovators or early adopters decreased from 2009 to 2010, and among nonusers we see that the proportion of late adopters or laggards is more pronounced in 2010 (see Figure 4-12). From these findings it would seem that using the Internet from handheld devices is becoming more of a mainstream activity as power users are close to becoming a majority of the student population and a lower percentage of these power users are early adopters.

In 2008, a poll conducted by the Wi-Fi Alliance confirmed what was already becoming obvious to higher education IT departments: 9 out of 10 college students considered Wi-Fi to be as essential to their academic lives as classrooms and computers. In fact, 48% of the students polled lightheartedly said they would give up beer before giving up Wi-Fi access, and nearly three-quarters said they would wear their school rival's team colors for a day rather than go without wireless access. Students said they used Wi-Fi in the classroom to get a head start on assignments before a class was finished, but more than half admitted to using wireless devices to check social networking websites, send e-mail, or

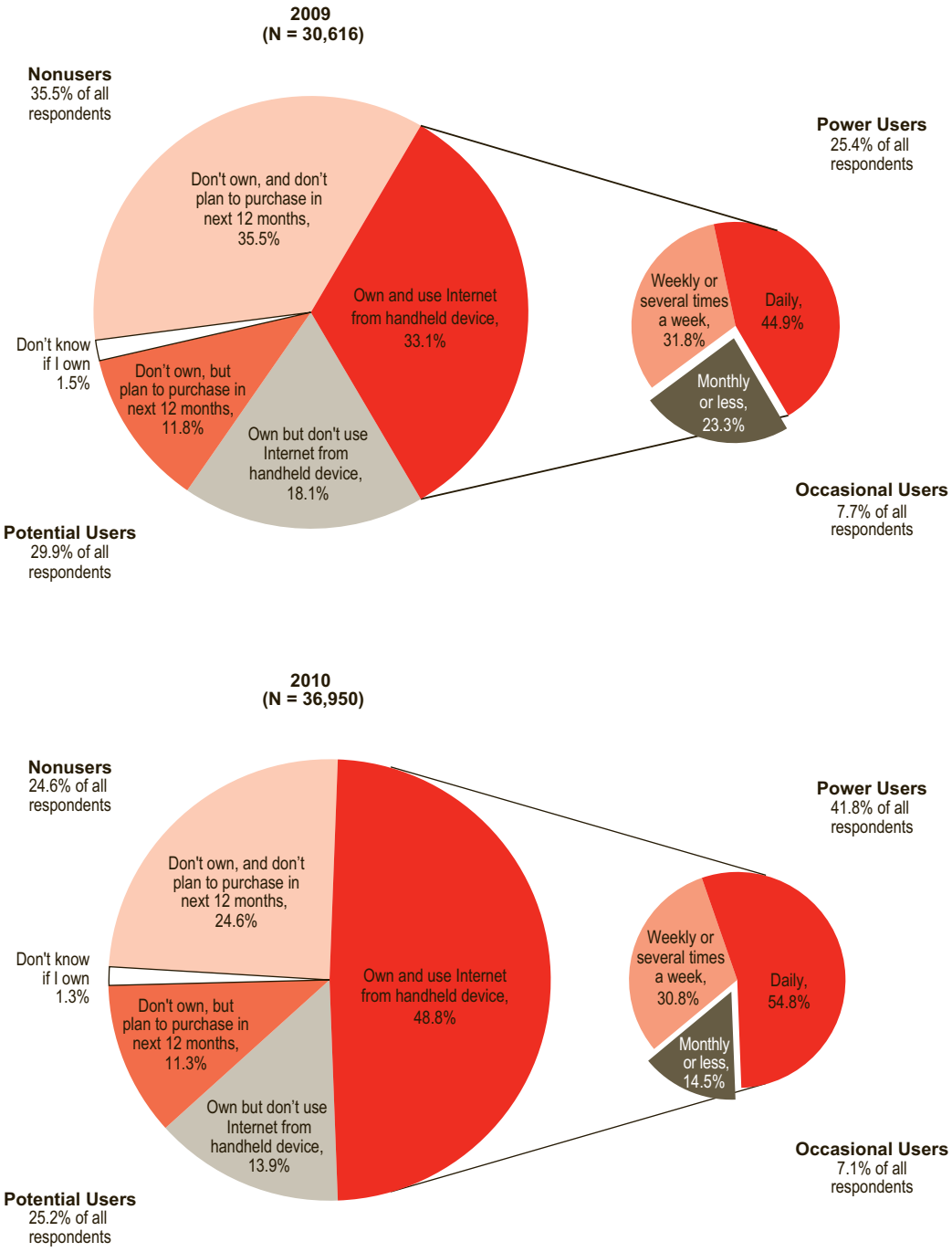
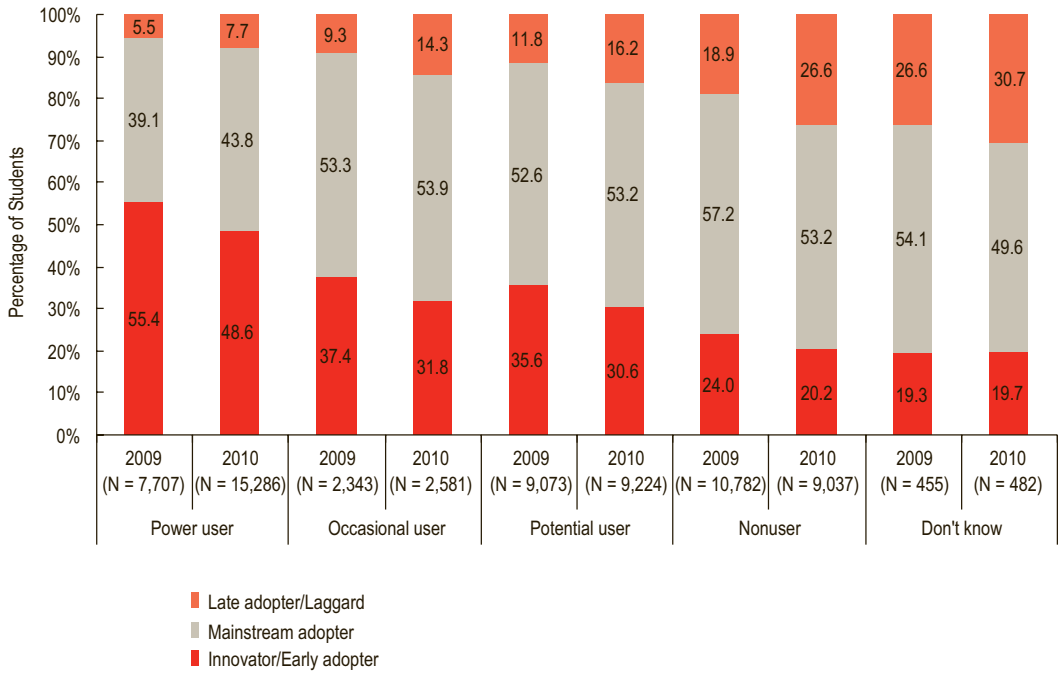


Figure 4-11. Internet-Capable Handheld Device Users, 2009 and 2010

perform other non-class-related activities.[24] With near-ubiquitous ownership of wireless devices—including laptops, netbooks, and smartphones—as indicated in our study, it is important for higher education IT to keep up with the demand for Wi-Fi access and understand the impact 3G and 4G cell networks may have on this demand.

Mobile learning tools are becoming more prevalent, and more and more students are coming to campus expecting to use the mobile Internet in support of their education. According to ECAR's messaging and communications study, as of summer 2008 many institutions were not prepared for a significant base of handheld device users. As we

Figure 4-12. Internet-Capable Handheld Device Users, by Technology Adoption, 2009 and 2010



wrote in last year's study, this may be reason for concern if student adoption far outpaces institutional support capability.

Endnotes

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8. This change in language may have had an impact on how students interpreted the question, because in 2009 the combined percentage of those who owned an Internet-capable handheld device (52.0%) or planned to purchase one within the next 12 months (11.8%) was less than in 2008 (66.1% and 5.3%, respectively). We were unable to determine whether the decline was a result of this change in our survey, the students are more or less familiar with the functionality of their devices and thus more accurate in their responses, or a true decline occurred in ownership of Internet-capable handheld devices in the 2009 respondent population. For the most recent survey text and location of the question, see Appendix B. For comparison, previous ECAR surveys may be found at http://www.educause.edu/ECAR/ResearchPublications/SurveyInstruments/1004.

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5
What Are Students Doing with Technology?

I took this survey on my iPhone in the middle of a finance discussion and didn't miss a beat. I love technology!
—An undergraduate student

Key Findings

- More than 9 out of 10 student respondents are using the college/university website, presentation software, text messaging, social networking websites, and a course or learning management system.
- The proportion of students using text messaging daily increased from about half in 2008 to about three-quarters in 2010, while daily instant messaging use decreased from a third of respondents to under a quarter over the same period.
- More than three-quarters of respondents who said they own and use a handheld device to access the Internet use them to check for information such as news, weather, sports, and other specific facts; to send or receive e-mail; or to use social networking websites. Two-thirds use them for maps to find places or get directions, and about a third use them to instant message, conduct personal business such as banking or shopping, or download/stream music.
- The proportion of respondents age 25 and older using social networking websites increased from a third in 2007 to more than three-quarters in 2010.
- Facebook use increased from 89% in 2008 to 97% in 2010, while MySpace use decreased from 48% to 22% over the same period.
- Six out of 10 female respondents said they put a lot of restrictions on access to social networking websites, while just 4 out of 10 male respondents did so.
- Male respondents were twice as likely to play online multiuser games as female respondents, and males were also more likely to use audio- and video-creation software and download or watch videos online on a handheld device.
- Eight out of 10 students rate themselves as very skilled or expert at using the Internet to effectively and efficiently search for information; fewer than 6 of 10 said they were very skilled or expert at evaluating the reliability and credibility of online information; and fewer than half said they were very skilled or expert at understanding the ethical or legal issues of accessing and using digital information.

Like the technologies they own, the activities students use them for are evolving over time, and a primary factor influencing what they do, and how often they do it, is mobility. Laptops, netbooks, and all types of handheld devices enable a constant connection to other people

and to a digital universe that was almost inconceivable a decade ago. The tools available and skills needed to use this equipment reflect the changing landscape of interpersonal communication and the unique socioeconomic and academic ecosystem in which undergraduates live and learn. While much is written about how today's traditional-age college students have thoroughly integrated IT into their lives, it is challenging to compare them with previous generations because of the incredible pace of change in technology. Just five years ago we asked students how they accessed the Internet, whereas today many think of it as a utility, much like they think of electricity; and Twitter and YouTube, household names today, were virtually unknown.

In this chapter we will explore undergraduates' IT activities and their perceptions about their skill levels using selected technologies. Like the hardware we ask about, some of these activities are rapidly moving through the adoption cycle while others are used at nearly the same frequency and by the same proportion of students as they were several years ago. In some cases, the popularity of a technology is driven by students' personal preferences or needs, but many are required to complete academic projects. Thus, each technology we ask about has its own pattern of use and its own place in the adoption cycle.

Computer and Online Activities

The IT activities we ask about include basic core applications, communications technologies, and selected new or emerging technologies. We then present the results in terms of how many students are engaged, how frequently they use the technology, and whether any demographic factors are associated with the activity. The demographic factors we analyze include gender, age, class standing (senior, freshman, or student from a two-year institution), major, on-campus or off-campus residence, and part-time or full-time enrollment status (see Table 5-1).

Technologies used in coursework—college and university library websites, presentation software, course or learning management systems, and spreadsheets—continue to be very widely used. Using the institution's library website has grown more integral to students' academic lives over the past several years. In the first ECAR student study in 2004, 83.6% of respondents reported using a library resource from an electronic device to complete a course assignment. This year, 94.2% report having used their institution's library website for school, work, or recreation, and more than a third (33.7%) of respondents use it several times a week or more often. Over the last four years, the proportion of respondents who use institution library websites at least once a year has hovered right around 95%, but the percentage of students who report using the library website daily has increased from 7.8% in 2007 to 17.9% in 2010. Declaring in open-ended comments that his/her institution's new digital library was a "great service," one respondent remarked that "there are so many sources that we can access on our computers. We used to have to search for physical copies of the books that would be checked out, missing, or misplaced. I find myself using this library more and more often and I'd love to see it expand."

The use of course or learning management systems has also grown to become an essential part of college life. From 72% in 2005, CMS use reached a full 90.3% in 2010, with 79.6% using it weekly or more often and more than a third (35.2%) using it daily. We discuss CMS use and student perceptions in greater detail in Chapter 6.

Of the other technologies we asked about that are commonly used in courses, we found that more than 8 out of 10 respondents (83.0%) use both spreadsheets and presentation software and fewer than 5% (4.4%) use neither. Business majors use spreadsheets

Table 5-1. Student Computer and Internet Activities (N = 36,950)

	Students Engaged	Median Frequency of Use*	Associated Demographic Factors
Almost All Students Engaged			
College/university library website	94.2%	Weekly	N/A
Presentation software (PowerPoint, etc.)	92.9%	Monthly	N/A
Text message	92.3%	Daily	Age (younger)
Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	90.4%	Daily	Age (younger)
Course or learning management system	90.3%	Several times/week	N/A
Most Students Engaged			
Spreadsheets (Excel, etc.)	85.7%	Monthly	Business majors/ seniors
Instant message	70.6%	Several times/week	N/A
Graphics software (Photoshop, Flash, etc.)	67.4%	Monthly	Fine arts
Some Students Engaged			
Use the Internet from handheld device (iPhone, Treo, BlackBerry, other Internet-capable cell phone, iPod touch, PDA, Pocket PC, etc.)	49.5%	Daily	N/A
Voice over Internet Protocol (VoIP) from your computer (Skype, etc.)	47.2%	Monthly	N/A
Follow or update microblogs (Twitter, etc.)	43.3%	Several times/week	N/A
Contribute videos to video-sharing websites (YouTube, etc.)	42.4%	Monthly	N/A
Contribute content to wikis (Wikipedia, course wiki, etc.)	39.7%	Monthly	N/A
Video-creation software (MovieMaker, iMovie, etc.)	39.5%	Once per quarter/ semester	N/A
Contribute content to blogs	36.1%	Monthly	N/A
Audio-creation software (Audacity, GarageBand, etc.)	34.0%	Once per quarter/ semester	Male
Online multi-user computer games (World of Warcraft, RuneScape, Lineage, poker, etc.)	26.9%	Monthly	Male
Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)	25.1%	Weekly	N/A
Online virtual worlds (Second Life, Forterra, etc.)	8.7%	Once per quarter/ semester	N/A

** The median frequency of use is calculated only for those students engaged in an activity. Technically, the median is the midpoint in a series of data values; half the data values are above the median, and half are below. Data values are once a year, once per quarter or semester, monthly, weekly, several times per week, and daily.*

more than respondents with other majors, and seniors use them more than do freshmen. We found a few other interesting associations between student demographics and the use of certain IT-based tools (refer to Table 5-1), but our impression is that students generally recognize the importance of knowing these tools. As one wrote, "I don't really think there's nearly enough required use of IT in courses here. One of my professors required that we use spreadsheets extensively, and most of my classmates were unfamiliar with the basics of Microsoft Excel. I've found through internships that spreadsheet knowledge is *the* primary tool used in business, and students that aren't proficient with it can be left in the dust."

This year's findings suggest that college students are actively participating in the remarkable growth of online digital video content.

In fact, simply keeping up with the growth in this activity has necessitated changes in our survey question in each of the last three years. In 2008 our survey question did not account for streaming content and did not distinguish between music and video—simply asking if the student "downloaded web-based music or videos." Last year we asked whether students "contributed *content* to video websites (YouTube, etc.)" and found that not quite half the respondents (44.8%) did so. This year, we wanted to know if they were submitting *video* content specifically, as opposed to comments about uploaded videos, so we asked if respondents "contributed *video* to video websites" and found that more than 4 in 10 respondents (42.4%) had done it and that 18.4% contributed video weekly or more often.

These numbers are not surprising in light of Facebook and YouTube video upload statistics. According to YouTube, on March 17, 2010, more than 24 hours of video was uploaded to their site every minute. The most recent statistics available for Facebook are from March 2009, when a Facebook developer revealed that Facebook receives some 415,000 video uploads per day, with 155,000 of them directly from webcams.[1]

Simply watching online video is becoming nearly ubiquitous. According to the online audience measurement service comScore, 178 million U.S. Internet users watched an astonishing 30.3 billion videos in April 2010.[2] Students are viewing online video to augment their coursework as well as to have fun; as a student wrote, "I find entertainment through online games and YouTube, and personal growth through independent research and, well, YouTube." Traditional-age undergraduates are certainly a key component in the phenomenal global growth in online digital video, a fact corroborated by the April 2010 *Retrevo Pulse Report*, an ongoing study of people and electronics. According to the report, 29% of Internet users under age 25 watched most or all of their TV on the Internet, compared with 13% of all online adults.[3]

Participation in other forms of content creation and sharing is relatively common for college students. In addition to the 42.4% who contributed video to video websites at least once a year, more than a third of respondents told us they had contributed at least that often to wikis (39.7%) or blogs (36.1%), and even more students said they had similarly updated microblogs like Twitter (43.3%). More than 7 in 10 students (71.9%) do at least one of these four activities, and 12.4% do all four.

For the last three years, ECAR has asked students about their use of online multiuser computer games and online virtual worlds, and we have seen no significant change in usage patterns in either of these activities. About 9% (8.7%) of this year's respondents said they visit online virtual worlds like Second Life or Forterra, and just over a quarter (26.9%) of this year's respondents engage in online multiuser computer games.

Last year, we began asking students if they use their computer for phone calls—Voice over Internet Protocol, or VoIP (e.g., Skype). More than one-third (37.7%) of last year's respondents reported using it, with a monthly median frequency of use. This year, 47.2% told us they have used it and, while the median frequency of use is still monthly, the percentage of students who use VoIP weekly or more frequently rose over last year's from 16.3% to 22.5%. Campus residency is the most significant factor in use of VoIP, with almost two-thirds (63.4%) of the respondents who live on campus reporting this year that they have used VoIP. Their median usage was once per month, versus 37.7% for off-campus respondents, with a median of once per year.

Internet Activities from Handheld Devices

In an April 2010 report on Internet trends, Morgan Stanley analysts developed a forecast of future Internet use showing a dramatic shift

toward mobile web use. Based on current exponential growth of the mobile web, the report concludes that the mobile web will be bigger than desktop Internet use by 2015. Five converging technologies and social adoption trends are driving this growth: 3G, social networking, video, VoIP, and impressive mobile devices.[4]

Although feature phone (non-smartphone) users still make up nearly half of all users accessing mobile browsers and apps, most of this growth in mobile Internet activity is being driven by the newer and more impressive devices.[5] "We are just at the beginning of a new wireless era where smartphones will become the standard device consumers will use to connect to friends, the Internet and the world at large," Nielsen media research reported in March 2010. In results that were similar to our own study's findings that nonowners planned to acquire smartphones (refer to Chapter 4), Nielsen found that while smartphones accounted for only 21% of wireless subscribers at the end of 2009, 45% of people they surveyed said their next device will be a smartphone. Because mobile phone contracts typically run two years, these anticipated new purchases will be spread over a long period, but Nielsen projects that the split between smartphones and non-smartphones will be 51% to 49% by the third quarter of 2011.[6]

The rise of the smart mobile device has introduced new complexity to the way consumers access Internet resources. The online audience measurement service comScore reported in June 2010 that growth in mobile content consumption is generating a great deal of interest in whether consumers are accessing content via application, browser, or both. "Although application access is clearly on the rise, with several categories more than doubling their audience via this method, content consumption via browser continues to be the most popular method for Americans to access mobile media." The comScore report found that social networking led as the top-gaining category for both application and browser access, and that accessing bank accounts was one of the fastest-gaining categories via both app and browser, as the convenience of mobile banking continues to appeal to a growing number of consumers.[7] As these devices and network technologies (3G and 4G) continue to improve, they enable more applications and activities to be performed and attract more users to the mobile Internet. According to our data, this cycle appears to be playing out on college campuses.

We asked respondents what Internet activities they do from their handheld devices (selecting all that apply from a list of 13 activities) and found that some of the categories mentioned in external research are showing up as popular activities in our results. Of the roughly one-half of respondents who own an Internet-capable handheld device and access the Internet with the device, more than 8 in 10 (85.0%) said they use it to check for information such as news, weather, sports, specific facts, etc., and 8 in 10 (81.7%) also said they use their handheld device to send and receive e-mail (see Table 5-2). In numbers that appear to support comScore's finding that social networking is the fastest-growing application for mobile access, more than three-quarters (76.9%) of our respondents said they use social networking sites from their handheld device, up from two-thirds (62.5%) among last year's respondents. These respondents tend to be younger, use their handheld more frequently, and use social networking websites more frequently overall.

Using handheld devices for Internet-based entertainment activities is gaining in popularity. More than a third of our study's respondents said they use their handheld device for downloading/streaming music (34.5%), while fewer download or watch videos online (30.2%) and even fewer download or play games online (25.5%). All of these activities

Table 5-2. Internet Activities Performed from Handheld Device*

Internet Activities Performed from Handheld Device	Percentage of Internet-Using Device Owners Who Perform Activity (N = 17,867)
Check information (news, weather, sports, specific facts, etc.)	85.0%
E-mail	81.7%
Use social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	76.9%
Use maps (find places, get directions, or plan routes)	68.6%
Instant message	38.3%
Conduct personal business (banking, shopping, etc.)	38.1%
Download/stream music	34.5%
Download or watch videos online	30.2%
Download or play games online	25.5%
Follow or update micro-blogs (Twitter, etc.)	21.0%
Use photo-sharing websites (Flickr, Snapfish, Picasa, etc.)	18.1%
Read or contribute to blogs	15.0%
Watch mobile TV	11.7%

** Includes only respondents who own an Internet-capable handheld device and access the Internet from the device*

saw increases over last year, and research indicates the global mobile entertainment industry will continue to grow. Smartphones are playing a significant role in shaping the market for mobile gaming. For example, comScore believes that an overall decline in the number of U.S. mobile gamers during the past year is largely due to decreasing interest in feature phone (i.e., non-smartphone) gaming as consumers move to smartphones. "As the market transitions from feature phones to smartphones, the dynamics of game-play are also shifting toward a higher-quality experience," said Mark Donovan, comScore senior vice president Mobile and senior analyst. "As a result, we can expect to see a profound increase in adoption of this activity, both in terms of audience size and overall engagement."[8]

Some of these activities could increase if devices and data plan prices decline, particularly activities that typically use more online time and bandwidth, such as reading or contributing to blogs, watching mobile TV, streaming video or music, or playing online games. The numbers of activities that users perform may also increase, although nearly a third (31.7%) of respondents who own an Internet-capable device and use the Internet from their device say they already do 7 or more of the 13 activities we asked about (see Figure 5-1).

Communications Technology

Traditional-age undergraduates are part of the generation that has been at the heart of the unfolding global communications revolution. The mix of technologies they use to stay in touch is constantly shifting, as our data has shown since we began this study, but for now it seems that text messaging and social networking sites together dominate the way this so-called "Net Generation" communicates (see Figure 5-2).

The ECAR survey does not ask the total number of text messages students send per month, but nearly everyone said they send them. More than 9 in 10 (92.3%) of the student respondents said they text, and nearly three-quarters of all respondents (72.9%) send text messages daily. Although 18- and 19-year-old respondents text more than other age groups (81.0% text daily),

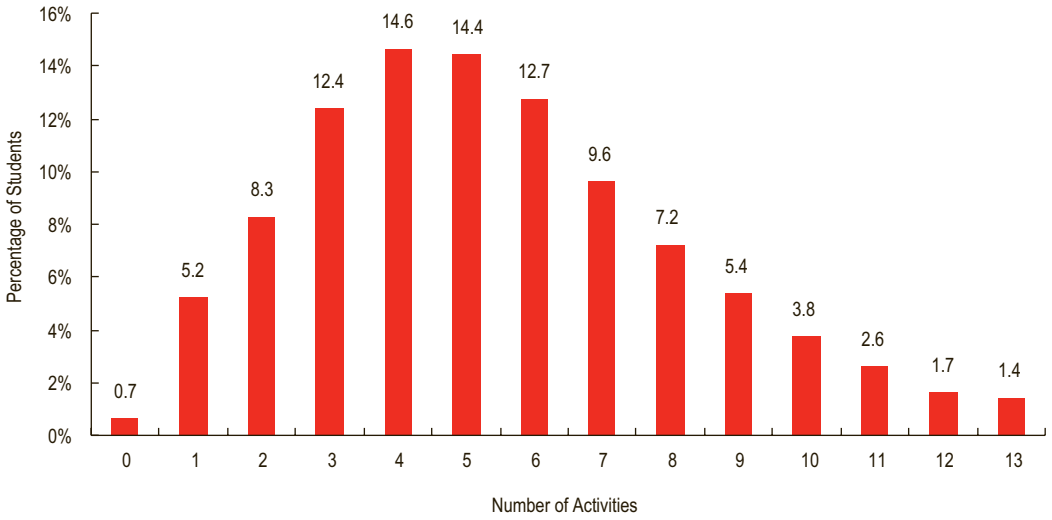


Figure 5-1. Number of Internet Activities Students Perform from Handheld Device (N = 18,041)*

** Includes only respondents who own an Internet-capable handheld device and access the Internet from the device.*

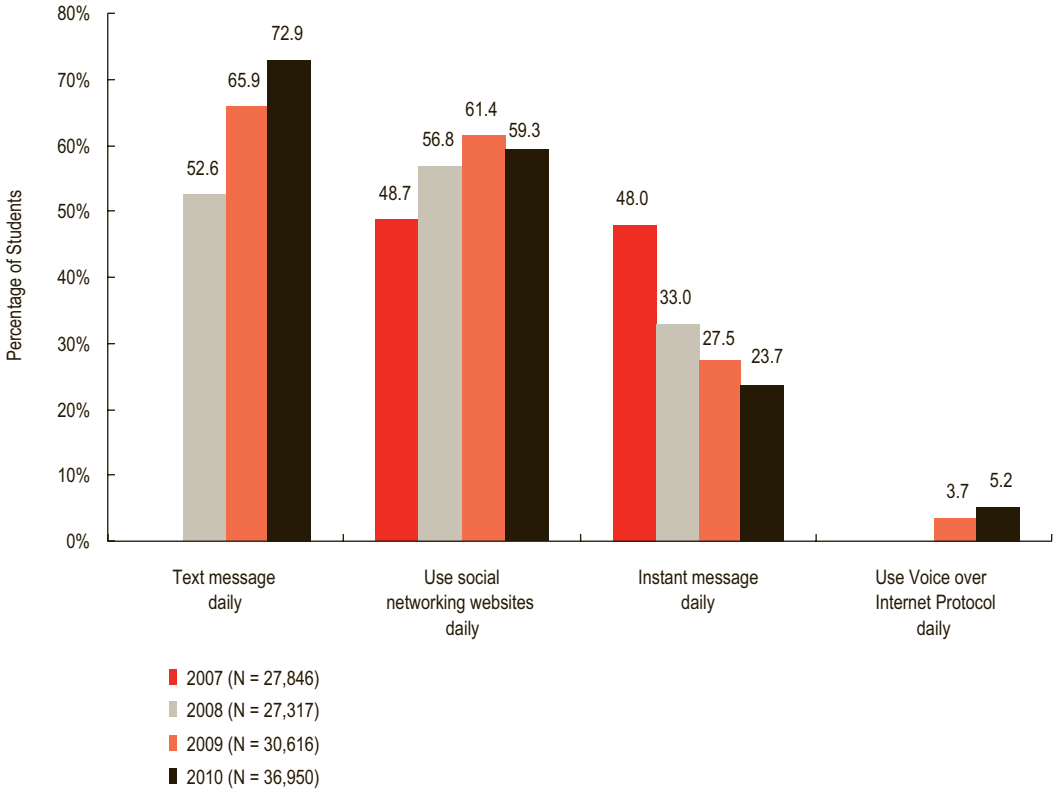


Figure 5-2. Change in Communication Technologies Used Daily, from 2007 to 2010*

** ECAR first surveyed use of text messaging in 2008 and first surveyed Voice over Internet Protocol in 2009.*

older respondents have begun to catch up. The growing use of text messaging among all our respondents is reflected in our results comparing data from 2008 to 2010, where respondents who indicated they send text messages daily increased from 52.6% to 72.9%. The prevalence of texting was evident in our focus groups, where one student noted, "For communication I only text, I don't use voice, because with text messages you know

who it's from." The same participant said "voice conversations are going away," but also commented on potential shortcomings of texting: "You can't get inflections like you can with voice so you have to do LOL after every message."

The growth in the use of SNSs has leveled off somewhat, probably because usage is so widespread in some age groups that it has begun to reach a ceiling. This year, 90.4% of respondents use SNSs, up from 81.6% of respondents in 2007. There has been a corresponding increase in daily use of SNSs, from 48.7% in 2007 to 59.3% in 2010. We will look at the use of SNSs in greater detail later in this chapter.

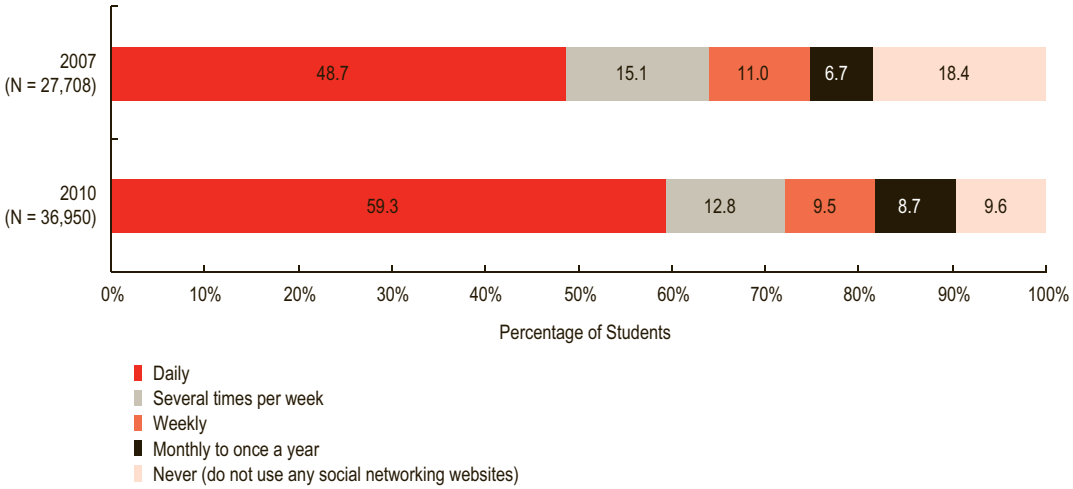
The dominance of texting and SNS use appears to be paralleled by a decline in instant messaging. Since 2007, the percentage of students who use instant messaging daily has dropped from 48.0% to 23.7%. However, this reported decline may be an issue of nomenclature. Formerly dominant instant messaging programs, such as Windows Live Messenger and ICQ, are likely losing ground to the functionality in other communications programs such as SNSs and VoIP—what the younger generation calls "chat" today comes from Facebook, Google, or Skype—and it may be that "instant messaging" as a stand-alone tool does not resonate with these students.

Social Networking

The social connectivity indicated in the 2010 ECAR student study is impressive. Overwhelming majorities report using text messaging (87.8%) or SNSs (81.7%) weekly or more often, more than half (51.3%) still use instant messaging that frequently, and more than 4 in 10 (43.0%) use all three weekly or more often. This culture of connectivity is also reflected in the fact that worldwide there are now more users on social networks than users of e-mail.[9] In our study, we found a notable increase in use of SNSs from 2007 to 2010 (see Figure 5-3).

Not only have social networks overtaken e-mail in terms of popularity, according to the analysts at the Internet data measurement service Hitwise, but social networks in general are also more popular than search engines in some parts of the world. As Hitwise reported recently, Facebook's overall web traffic pulled ahead of Google's for the first time in the United States in March 2010.[10] The ramifications of extensive use of SNSs are reflected in student responses to the open-ended question in the survey. Quite a few complained about student use of SNSs during class, and another group expressed concerns about the distraction they pose. "I do a lot of procrastinating on Facebook. A *lot*!" writes one student, while another

Figure 5-3. Use of Social Networking Websites, 2007 and 2010



commented, "From the social networking aspect, I have one that takes up way too much of my time." Voicing a different opinion, a student shared, "Social sites like Facebook are really good stress relievers during stressful times in school."

Age and the Use of Social Networking Websites

It is widely known that older Americans are fueling the continued growth in use of SNSs. In our study we have seen that respondents ages 18 and 19 have had a nearly consistent percentage of use ranging between 93.5% and 95.4% for the last four years, while students 25 and older have seen very steady increases over the same period (see Figure 5-4). Surprisingly, the influx of older adults into the SNS world does not appear to have initiated a decline in use by younger SNS users. In Anderson Analytics' annual GenX2Z American College Student Survey conducted in the fall of 2009, despite the popularity of Facebook among parents and even grandparents of college students, there has been almost no fallout. "Once a trend goes mainstream, it often gradually loses its 'cool' factor among young people, and they move on to the next 'big thing,'" said Tom H. C. Anderson, managing partner of Anderson Analytics. "Our data indicate this is not the case with Facebook."[11]

When we asked respondents to identify the social networking sites they use, some of which have other primary functions, Facebook came out on top, and similar surveys have consistently reported the same result (see Table 5-3).[12]

Our study indicates a pronounced difference between Facebook and MySpace, with 96.6% saying they use Facebook and 22.5% saying they use the once-dominant MySpace. We also found significant changes in overall use of the three most commonly used SNSs—Facebook, MySpace, and LinkedIn—between 2008 and 2010. Facebook and LinkedIn saw increases in use, while MySpace declined from just under half of respondents (48.3%) in 2008 to under a quarter of respondents (22.5%) in 2010.

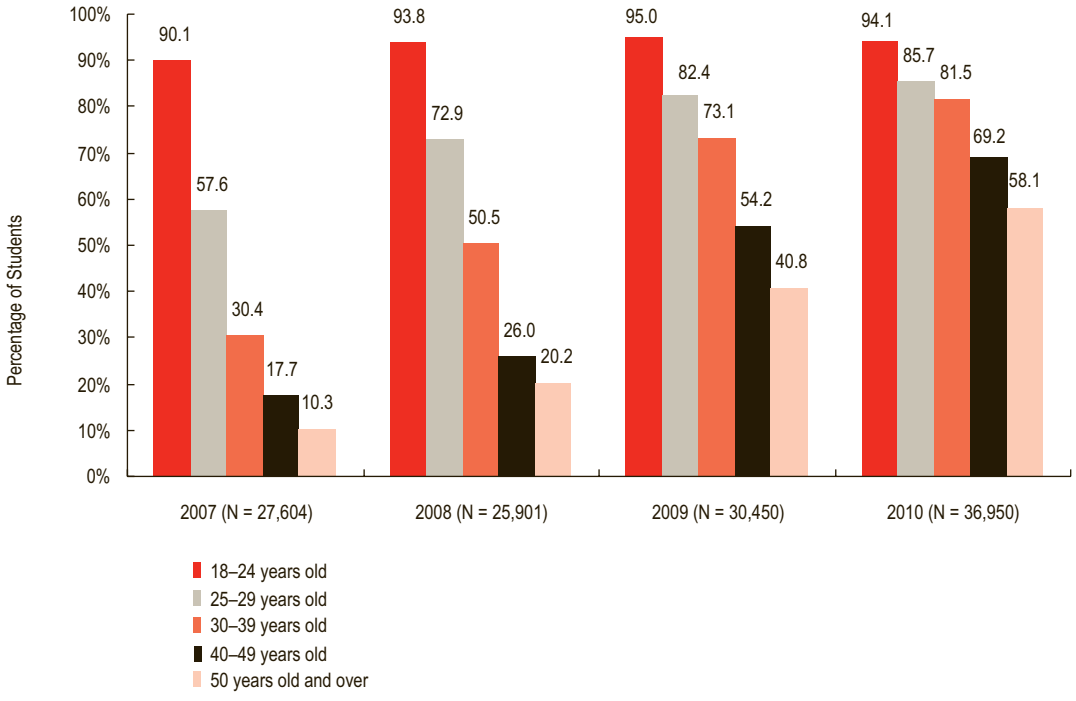


Figure 5-4. Percentage of Students Who Have Used Social Networking Websites, by Age, 2007 to 2010

Table 5-3. Social Networking Websites Used by Students (N = 33,389)*

Social Networking Website	Percentage of Students
Facebook	96.6%
MySpace	22.5%
LinkedIn	11.2%
Flickr	6.1%
Classmates	2.7%
myYearbook	1.2%
Tagged	1.2%
Bebo	0.5%
Other	10.6%

** Includes only respondents who use SNSs.*

How Social Networking Websites Are Used

Students are using SNSs for a variety of communications-related activities. We asked students, "How do you use social networking websites?" and offered a list of 14 activities from which they were to check all that applied (see Table 5-4). The top two selections made by respondents were "Stay in touch with friends" (96.0%) and "Share photos, music, videos, or other work" (72.1%), which were also associated with student use of Facebook. The third most popular activity was "Find out more about people (I may or may not have met)" (52.6%).

When we asked about use of social networking websites in a focus group, a senior told us, "I use Facebook to keep in touch with people. I actually use it like a family tree. I found family members through Facebook. My dad passed away and I used his last name to find family members." Another participant reported using Facebook as "a sort of mass communication for family, friends, and organizations. If I want input for a student organization, I can update my status

Table 5-4. How Social Networking Sites Are Used (N = 33,389)*

Activity	Percentage of Students
Stay in touch with friends	96.0%
Share photos, music, videos, or other work	72.1%
Find out more about people (I may or may not have met)	52.6%
Communicate with classmates about course-related topics	51.5%
Plan or invite people to events	50.4%
Follow/interact with my college's or university's social/extracurricular activities (athletics, clubs, arts, etc.)	35.0%
As a forum to express my opinions and views	27.6%
Play games	27.0%
Participate in special-interest groups	21.9%
For professional activities (job networking, etc.)	21.2%
Make new friends I have never met in person	16.2%
Other	13.1%
Communicate with instructors about course-related topics	7.9%
Use my college's or university's administrative services or communicate with administrative offices (registration, advising, financial aid, billing, etc.)	6.7%

** Includes only respondents who use SNSs.*

and ask. If I hear a name and I want to put a face to a name, it's an easy way to do that." A political science major who said "I enjoy learning on Facebook about other people" explained why: "I like the political arguments. The night of the passing of the national health care bill I was entertained for hours. And, on election night so many friends had something to say."

Some students indicated they were using SNSs for organizing and communicating to groups: about half of respondents who use SNSs said they use them to plan or invite people to events, and around a quarter use SNSs as a forum to express their opinions and views or to participate in special-interest groups. Just over a quarter said they use them to play games, and one in five uses them for professional activities such as job networking.

A small majority of students who use SNSs said they use them to communicate with classmates about course-related topics, but they used them significantly less to interact with faculty; fewer than 1 in 10 said they use them to communicate with instructors about course-related topics. Respondents said they use SNSs for other campus-related activities, with a third saying they use them to interact with their college's or university's social/extracurricular activities, although far fewer use SNSs to use administrative services or communicate with administrative offices such as registration, advising, financial aid, or billing. A student wrote in the open-ended comment about the effective use of social networking by his/her institution: "I like the use of Facebook by some campus services and clubs. Career Services is particularly on top of using IT to communicate upcoming events to students." We will look at SNS and course-related activities in greater detail in the following chapter.

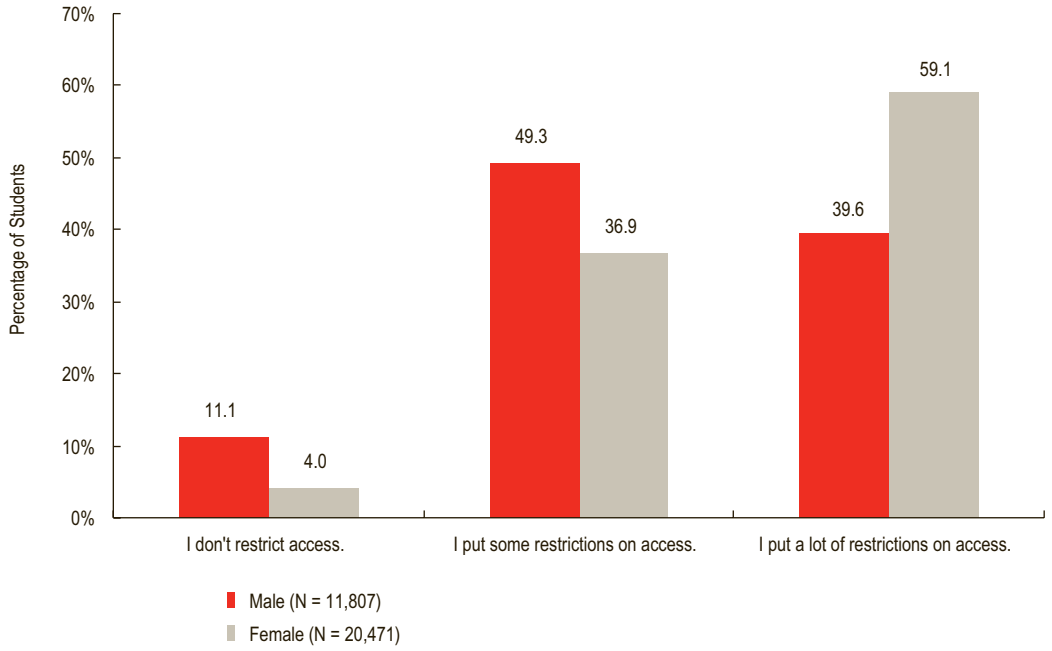
Social Networking Websites and Privacy Concerns

The magnitude of the numbers of people around the world who are embracing social networks is remarkable. As of July 2010, Facebook alone claims to have more than 500 million users, representing more than a fifth of the 1.8 billion Internet users worldwide. The massive volume of authentic, personal data about people's interests, tastes, and friends held in Facebook's proprietary system is priceless, as the company has found out the hard way when attempting to monetize its content. Every time it has tried to capitalize on this data, Facebook has encountered fierce opposition from the people who generate it, including a recent attempt in 2010 that prompted the Electronic Privacy Information Center, an advocacy group, to file a complaint with the Federal Trade Commission.[13]

Because so much attention has been drawn to privacy and security concerns, we were curious about whether students limited or restricted who has access to their profiles on SNSs. We found that just 6.6% of those who responded had applied no restrictions at all, and only 1.7% said they did not know whether they had. Four in 10 (40.7%) said they applied "some restrictions," and just over half (51.0%) said they put "a lot of restrictions" on access to their SNS profiles. Not surprisingly, in light of well-publicized incidents of cyberstalking and cyberbullying, we found that female respondents were more likely to put "a lot of restrictions" on their profiles than were males (59.1% versus 39.6%), while males were more likely to report "some" restrictions rather than "a lot" (see Figure 5-5).

Stories about students being passed over for jobs, denied admission to a desired college, or disciplined by their university because of content posted in social networks are making headlines, and students are beginning to realize the consequences of careless use of Facebook and other social networking websites. Most experts believe that online privacy will continue to be an issue for the next several years because technology is changing so fast that privacy protection rules, laws, and guidelines will struggle to keep up. Right now we should

Figure 5-5. Restricting Access to Social Networking Site Profiles, by Gender



focus on keeping students and educators aware of the pitfalls of sharing too much information and how to avoid them.

Technology and Information Literacy Skills

In addition to exploring the technologies students own and use, our survey asked students to assess their skills at a set of computer technologies and information literacy practices that are important to the undergraduate experience and employment. Self-assessment is not a perfect proxy for actual skills, and research, including our experience asking these questions since 2004, finds that males often rate their skills higher than females; but the ECAR student respondents' answers provide insight into their perceptions about their IT skills and where they are most and least comfortable with these skills.[14]

Technology Skills Self-Assessment

Respondents indicated they have confidence in their skills with tools used in the college academic environment, including presentation software, spreadsheets, course and learning management systems, and college and university library websites. On a scale from "not at all skilled" to "expert," students who use these tools generally rated themselves between "fairly skilled" and "very skilled" with them (see Table 5-5). Students assessed themselves lower on their computer maintenance skills and their use of graphics software, where the mean skill level for respondents was between "not very skilled" and "fairly skilled."

In the survey comments, some students expressed frustration about their level of skills with these tools, as they were aware of the technology's importance for their employment. "I wish professors encouraged us to use programs such as Excel and Access, programs I am most likely going to use in my career (whatever it may be). I wish there were 'real life' assignments where we *had* to use technology the workplace will require of us so we have that knowledge come career time." An older student who said "Many people my age are returning to school and don't know all of the IT 'mumbo-jumbo'" offered the following suggestion: "It would be nice if some professors would take that into consideration when assigning activities that require PowerPoint,

Table 5-5. Student Technology and Information Literacy Skills Self-Assessment*

	Students Using the Technology	Mean**	Std. Deviation
Technology Skills			
Presentation software (PowerPoint, etc.)	34,123	3.63	0.830
Using the college/university library website	34,690	3.43	0.866
Spreadsheets (Excel, etc.)	31,525	3.34	0.901
Course or learning management system	32,909	3.19	1.010
Computer maintenance (software updates, security, etc.)	36,669	2.87	1.142
Graphics (Photoshop, Flash, etc.)	24,816	2.81	1.024
Information Literacy Skills			
Using the Internet to effectively and efficiently search for information	36,716	4.14	0.791
Evaluating the reliability and credibility of online sources of information	36,691	3.65	0.918
Understanding the ethical/legal issues surrounding the access and use of digital information	36,773	3.43	1.007

** Means and standard deviation calculations include only students who use the technology.*

*** Scale: 1 = not at all skilled, 2 = not very skilled, 3 = fairly skilled, 4 = very skilled, 5 = expert*

Excel, etc. It would be nice if they could pair us in groups of older and younger students so we can learn from each other. They don't have the life experience and we don't have the computer experience they teach in school. It would be beneficial to all, I think."

We found that older students tended to rate their skills with presentation software lower than younger students, but age had no association with the rest of the skills we asked about. Nonetheless, even traditional-age students sometimes feel that their technology skills are lower than those of younger generations, as noted by a vocal-performance major who said in the focus groups, "I train my dad on technology every Sunday, but the generation after me knows even more. I recently had a 6-year-old show me how to do things on my iPod."

Several students suggested introductory classes or workshops on basic IT skills to level the playing field, acknowledging that training and practice were the key to successful use of technology. "Most classes don't use enough of the Office products to function outside of school," wrote a student who suggested, "It should be required to have Word and Excel in *every* program. Younger students know how to use all the social websites, but cannot set up a spreadsheet or type a decent letter." Another shared, "I would say that I think I am mostly afraid to start using new technology" and confirmed that practicing made a difference: "Once I use it a few times I normally like it and use it more." Our study supports this idea because, as would be expected, we found a strong association between frequency of use of technologies and a respondent's self-assessed skill level, as shown for the five technologies for which we asked about both (see Table 5-6).

Information Literacy Skills Self-Assessment

Experts agree that information literacy is a vital component of education and workforce preparedness in a competitive global economy. Mastery of basic digital and information literacy skills enables effective participation in our ever-expanding global knowledge-based society. The National Forum on Information Literacy (NFIL) defines information literacy as "the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand."[15]

While this is only one of many definitions of what makes a person digitally literate, it

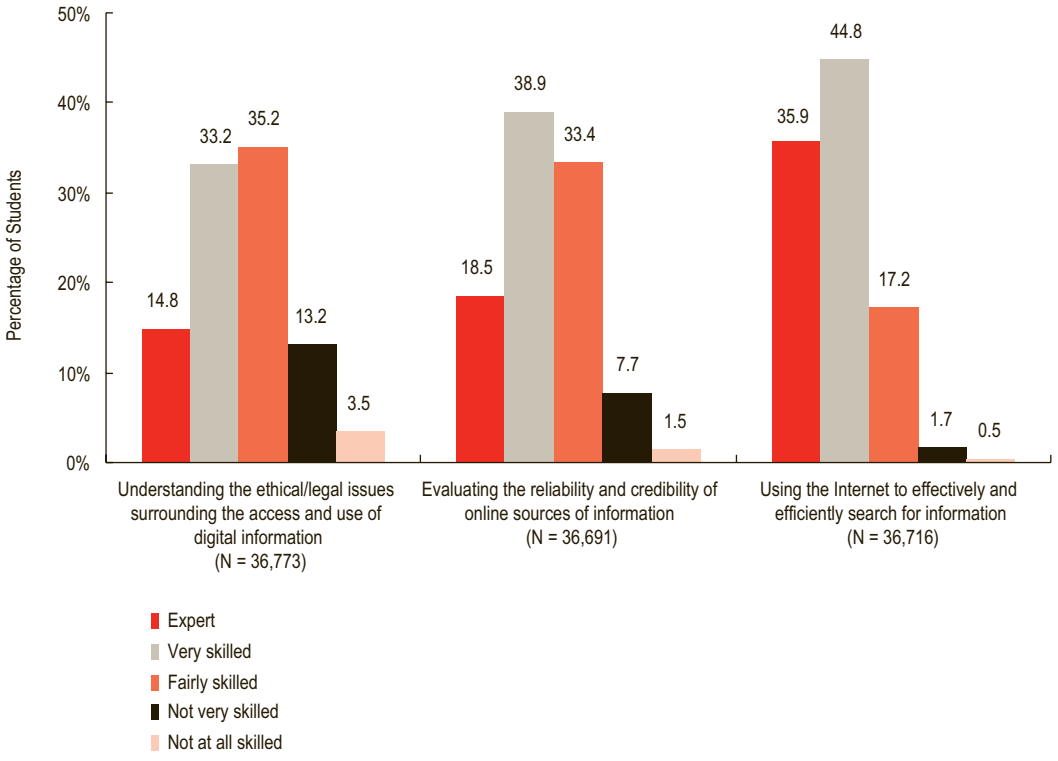
is widely accepted that this is a fundamental skill that should be taught and reinforced in higher education. To explore this concept, ECAR asks three survey questions about information literacy derived from the Association of College and Research Libraries (ACRL) Information Literacy Competency Standards for Higher Education—now the most used framework for creating information literacy initiatives and programs.[16] As in previous years, our results show that overall, respondents consider themselves quite Internet-savvy, although they are stronger in some areas (see Table 5-5 and Figure 5-6).

Table 5-6. Student Technology Skills Self-Assessment, by Frequency of Use

Technology	Mean Skill Level*						
	Daily	Several times per week	Weekly	Monthly	Once per quarter or semester	Once per year	Never
Course or learning management system (N = 36,950)	3.42	3.20	2.97	2.82	2.73	2.58	–
Using the college/university library website (N = 36,821)	3.87	3.68	3.48	3.27	2.92	2.65	2.19
Spreadsheets (Excel, etc.) (N = 36,768)	4.12	3.82	3.52	3.26	2.95	2.63	2.16
Presentation software (PowerPoint, etc.) (N = 36,694)	4.11	3.95	3.82	3.69	3.43	3.11	2.52
Graphics software (Photoshop, Flash, etc.) (N = 36,712)	4.00	3.60	3.20	2.88	2.45	2.14	1.67

** Scale: 1 = not at all skilled, 2 = not very skilled, 3 = fairly skilled, 4 = very skilled, 5 = expert*

Figure 5-6. Student Information Literacy Self-Assessment



Eight out of 10 students (80.7%) give themselves high marks (expert or very skilled) for their skills in searching the Internet effectively and efficiently. Although students' assessments of their ability to evaluate the reliability and credibility of online information and their understanding of related ethical and legal issues are lower, overall ratings are still high (refer to Table 5-5). These positive perceptions are generally consistent across age, gender, major, and Carnegie class, and there has been no meaningful change in respondents' assessments of their information literacy skills in the three years we have been asking about them.

Self-Assessed Technology and Information Literacy Skills and Technology Adoption

There is a strong association between technology and information literacy skills and technology adoption. Students who saw themselves as innovators and early adopters ranked their technology and information literacy skills higher than did other students. As Figure 5-7 shows, 92.0% of innovator/early-adopter respondents saw themselves as very skilled or expert at using the Internet to search effectively and efficiently for information, while just 6 out of 10 late adopters or laggards (61.3%) rated their skill level this high. We see the same pattern in the technologies for which students report lower overall skill levels (refer to Table 5-5). For example, just over a third (34.9%) of the innovator/early-adopters perceived themselves as very skilled or expert in use of graphics software, and only 13.8% of the late-adopters/laggards rated their skills at that level.

The difference between innovator/early-adopters and late-adopter/laggards becomes more pronounced with technology that is generally viewed as challenging or complex. For instance, more than half of the innovator/early-adopters (53.4%) viewed themselves as very skilled or expert in computer maintenance, but just 1 in 10 (10.0%) of the late-adopter/laggards rated themselves this highly.

The Persistent Gender Gap in the Use of Certain Technologies

While gender has become less of a factor in such areas as computer ownership and time spent on the Internet since ECAR began this study, several areas that we explore reveal a strong and enduring association with a respondent's gender. In addition to the gender differences in technology adoption and restricting access to SNS profiles (refer to Figures 4-1 and 5-5) and in self-assessed skill level with computer maintenance as discussed earlier in this chapter, there are persistent gender differences in use of certain technologies (see Figure 5-8). Male respondents were twice as likely to play online multiuser games and were also more likely to use audio- and video-creation software and download or watch videos online on a handheld device.

Although we have been asking respondents if they use social bookmarking/tagging since 2008, this is the first year we found gender to have a notable association with the use of this technology. Other research, however, has found social bookmarking, particularly Digg, to be used more by men—including one study that found that 64% of Digg users were male.[17] An April 2009 Pew Internet and American Life Project report that explored a number of Internet-related activities found that women were more likely to use social networking websites overall and men were more likely to use transactional types of online tools, such as banking. According to the study's author, Aaron Smith, Pew did not examine gender breakdowns on Digg but "it makes sense that men, who tend to use social networking for the purpose of sharing

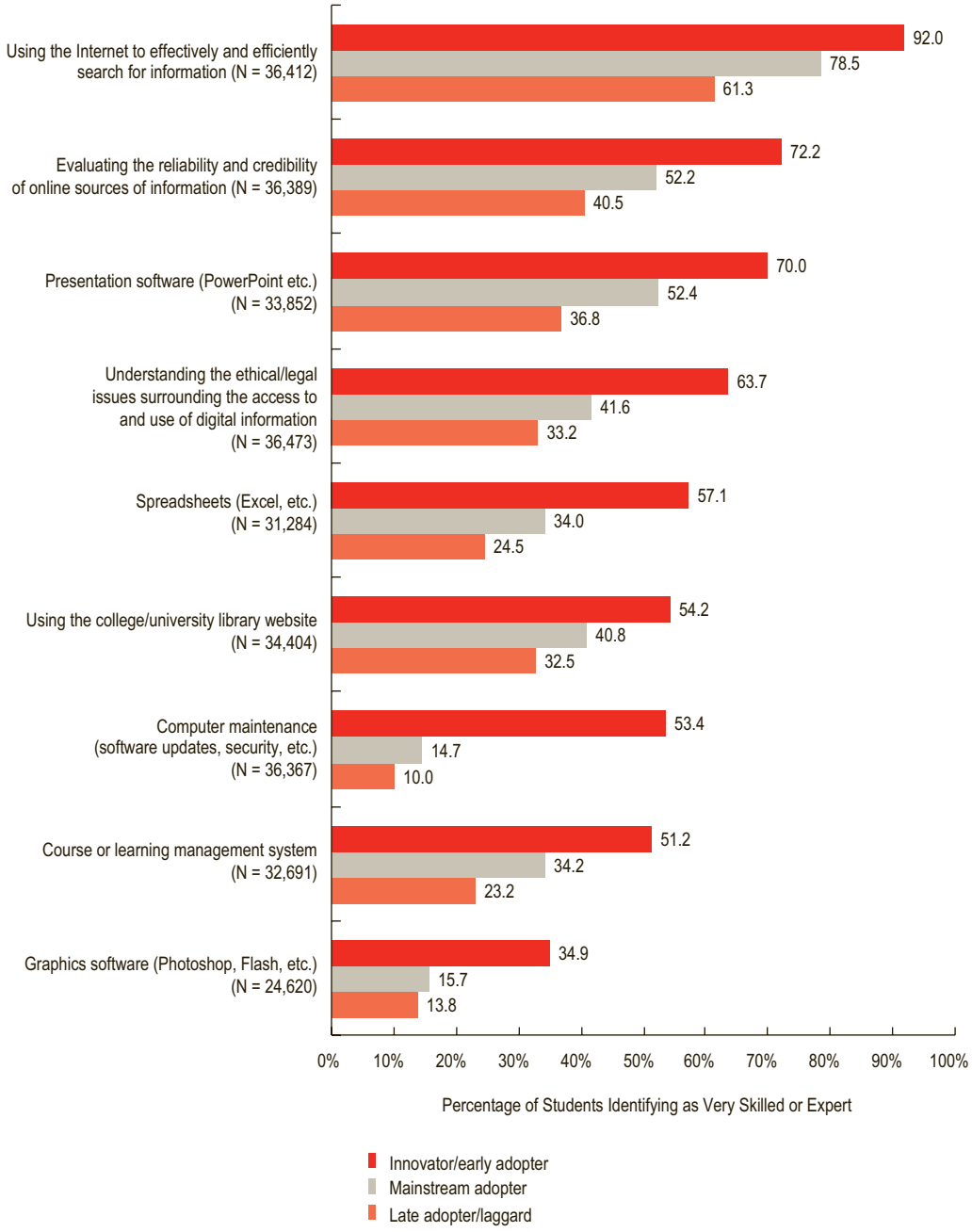


Figure 5-7. Students Who Identify Themselves as "Very Skilled" or "Expert" with Technology and Information Literacy Skills, by Technology Adoption*

** Includes only respondents who used the technology or information literacy skill.*

information, would be more interested in such a site." The Pew study reported that gender gaps have narrowed regarding overall Internet use. A few years ago, men were more likely than women to be online, said Smith, but that's no longer the case. "In general, a lot of the general gender differences in Internet usage that we saw have pretty much gone away," he said. "It tends to show up more in the applications they use than whether they go online and whether they have a computer."[18] As social networking and mobile technology continue to converge, it will be interesting to watch how technology adoption and gender intersect as these types of applications evolve.

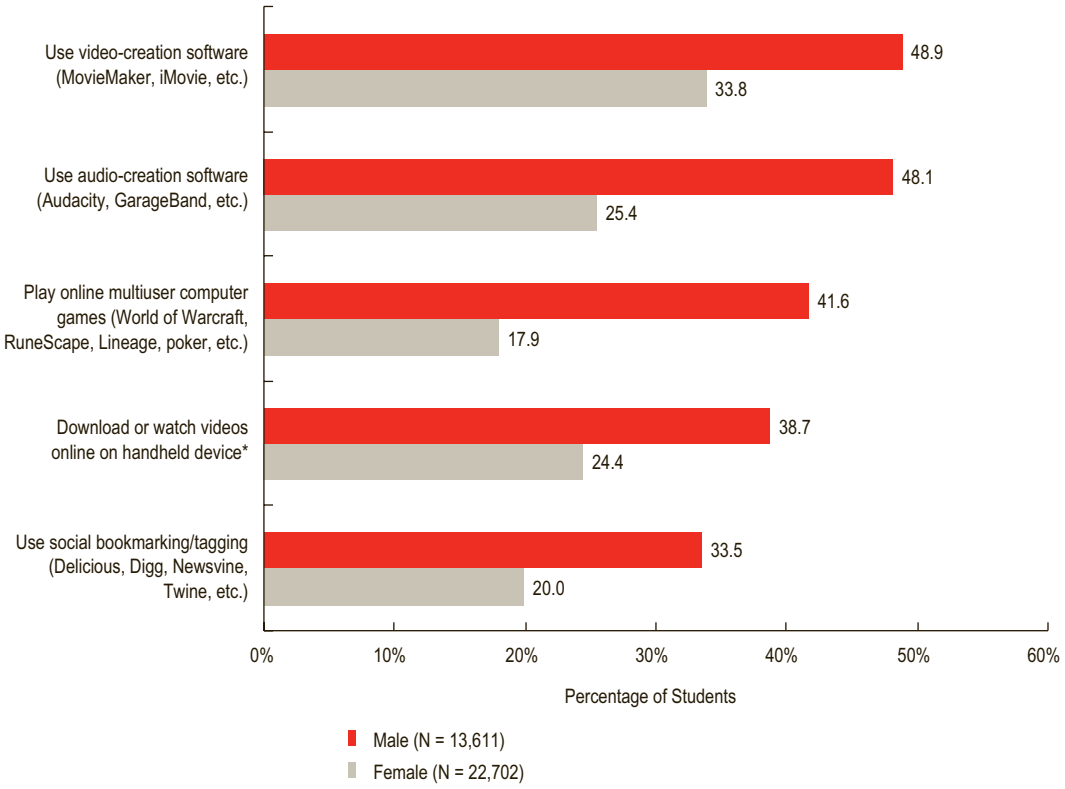


Figure 5-8. Use of Selected Technologies, by Gender*

** Includes only respondents who own an Internet-capable handheld device and access the Internet from the device.*

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6
IT and the Academic Experience

I am taking a class that requires me to tweet, blog, and Facebook. I have learned more from that class than I have from many. With the right structures and a cool instructor, technology definitely works!

—An undergraduate student

Key Findings

- More than a third of respondents were using web-based word processor, spreadsheet, presentation, and form applications such as Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc., during the quarter or semester of the survey, and of these, more than half were using them to collaborate or work with other students.
- More than a third of respondents were using wikis in a course during the quarter or semester of the survey, and a third of these were using them to collaborate or work with other students.
- Nearly one in three respondents were using social networking websites in a course, and about half of these respondents were using them to collaborate or work with other students during the quarter or semester of the survey.
- Four in 10 senior respondents from four-year institutions had accepted current or previous college or university instructors as friends or contacts on social networking sites, whereas fewer than a quarter of freshmen and about a quarter of all respondents from two-year institutions did so.
- Students who were using social networking websites in a course during the quarter or semester of the survey were more likely to say they would like to see greater use of SNSs in their courses.
- Half of respondents agreed or strongly agreed with the statement "My institution's IT services are always available when I need them for my coursework," a third were neutral, and slightly fewer than 15% disagreed or strongly disagreed.
- More than a third of respondents from AA institutions said that all or some of the courses during the quarter or semester of the survey were entirely online, compared with fewer than 20% of all respondents from four-year institutions.
- Fewer than half of the respondents reported that most or almost all of the instructors use IT effectively in their courses.

Information and communication technologies have become nearly as integral to teaching and learning as books. Rare is the course that does not utilize some form of IT, from using electronic resources in the library to conducting Internet research to delivering grades and other content through a course management system. IT enables students

to participate more actively in the learning process, and the technologies that support this interaction are at the core of the changing face of postsecondary education.

Change seems to be coming faster every year. The annual *Horizon Report*, produced by the New Media Consortium and the EDUCAUSE Learning Initiative, charts the landscape of emerging technologies that will likely impact college campuses within the next five years. Some of the key technology trends identified in the 2010 *Horizon Report* can already be found in the results of this year's ECAR student study, including the fact that mobile computing is a significant part of students' lives. The desire to be able to work, learn, and study whenever and wherever they want to is fueled by students' adoption of mobile devices and the continuing acceptance and adoption of cloud-based applications that enables this mobility. Indeed, students appear to be readily adapting to the consumer-driven model whereby it matters less where our information is stored as long as it is accessible no matter where we are and by any device we choose. Farther out on the timeline, the *Horizon Report* projects that the work of students will be increasingly seen as collaborative in nature and driven by more cross-campus collaboration between departments and the emergence of many new, and often free, tools that make collaboration easier than ever before.[1]

Mobility, cloud computing, and collaboration may be poised to reshape the college classroom, but higher education institutions seeking to leverage technology to improve educational outcomes still need to balance the expectations of younger, traditional-age digital natives coming to campus against the needs of the growing numbers of older students who may be less technical. When looking at ways to improve the process of teaching and learning, it is important to understand the range of students' uses of and perspectives about technology in their academic environment. In this chapter we will expand upon the previous chapters' explorations of students' IT experience in general to look more in depth at findings about

- what technologies students were using in courses during the quarter/semester of the survey, with a special look at web-based tools;
- the use of course management systems and whether students' experiences with them are positive or negative;
- how social networking is integrating into the academic experience;
- what types of technologies students like to use for learning;
- how much IT students prefer in their courses;
- student opinions about their instructors' use of IT in courses; and
- student perceptions about the impact of IT on their courses.

Technologies Used in Courses the Quarter/ Semester of the Survey

Each year the ECAR student survey asks respondents about technologies they were actively using as a part of their courses at the time of the survey (in 2010, from February 22 through April 9). We divide the technologies here into two groups: a core set of mostly older online and PC-based technologies, and newer web-based (or "cloud") resources with collaborative potential. Of the core technologies, we found majorities of respondents were using the college or university library website, presentation software, and the institution's course or learning management system (see Table 6-1). We found class standing—whether a student was a senior or freshman from a four-year institution or a student from a two-year institution—was associated with the use of a few technologies, including presentation software, a pattern that was reflected in previous years' studies. Fewer than half of respondents overall were using spreadsheets,

and as in the past, seniors were more likely than freshmen to report using them, though the difference is not as pronounced as in the past. We have seen, however, a slight increase in use of spreadsheets among students from two-year institutions over the last three years. The difference between seniors and other students in the use of presentation software and spreadsheets is most likely due to the fact that upper-division courses, which are often more focused on student major, make greater use of these two fundamental applications.

About a quarter of respondents said they were using e-books or e-textbooks in a course during the time of the survey. This was the first year we asked about e-books/e-textbooks, so we don't know whether this represents a rapid penetration into courses, but given that barely 3% of respondents reported owning a dedicated e-book reader (refer to Chapter 4), it is likely that students are using laptop/desktop computers, or possibly smartphones or other handheld devices, to access them. Students who said they were using e-books/e-textbooks in their classes were also more likely to be using textbook publisher resource websites, which we discuss below in Table 6-2.

In our previous surveys we asked students if they were using podcasts during the quarter/semester of the survey and found that very few were using them (only 5.8% reported using them last year). This year we changed the question slightly to ask if students were using course lecture podcasts or videos and found that nearly one in five respondents said they were. About the same percentage of students told us they were using clickers or

Table 6-1. Core Technologies Used in Courses the Quarter/Semester of the Survey, by Class Standing and Overall

	Seniors (N = 15,586)	Freshmen (N = 12,408)	Students from Two-Year Institutions (N = 4,559)	All Students (N = 36,950)*
Used by Many Students				
College/university library website	73.4%	68.7%	59.6%	69.7%
Presentation software (PowerPoint, etc.)	75.0%	61.9%	52.6%	66.8%
Course or learning management system	70.9%	61.5%	61.4%	66.5%
Spreadsheets (Excel, etc.)	52.0%	38.2%	36.5%	44.9%
Used by Few Students				
E-books or e-textbooks	23.3%	26.3%	22.2%	24.2%
Course lecture podcasts or videos	18.6%	16.8%	17.2%	18.1%
Clickers or student response systems	10.8%	28.5%	9.2%	17.1%
Instant messaging	16.0%	17.4%	14.4%	16.2%
Graphics software (Photoshop, Flash, etc.)	17.6%	11.0%	14.1%	14.7%
Programming languages (C++, Java, etc.)	12.3%	12.0%	10.3%	12.0%
Discipline-specific technologies (Mathematica, AutoCAD, STELLA, etc.)	12.2%	9.7%	5.5%	10.7%
Simulations or educational games	7.8%	7.8%	7.9%	7.8%
Video-creation software (MovieMaker, iMovie, etc.)	8.0%	7.1%	4.9%	7.2%
E-portfolios	8.5%	6.0%	5.3%	7.1%
Audio-creation software (Audacity, GarageBand, etc.)	6.0%	5.5%	3.8%	5.5%

** "All Students" includes 4,227 respondents from four-year institutions who answered "Other" and 170 who did not respond to "What is your class standing?"*

student response systems, and freshmen were quite a bit more likely to be using them than seniors or community college students. Instant messaging (IM) was used by fewer students, but those who were instant messaging in a course during the quarter/semester of the survey tended to use instant messaging more overall, including on an Internet-capable handheld device.

Over the years we have found that certain majors are associated with the IT that respondents use, which makes sense because required technologies vary by major. Business majors, as would be expected, are heavier users of spreadsheets in their courses, as are engineering majors, who also use programming languages and discipline-specific technologies in courses more than other majors.

Fine arts majors indicate they make greater use of graphics and audio-creation software in their courses than respondents with other majors. However, in contrast to previous years, we find no meaningful association between fine arts majors and video-creation software in this year's study. This finding is perplexing, but one speculation is that it may be related to growth in use of YouTube and other video websites by all students, perhaps leading to more widespread video creation and thus weakening the disparity between fine arts majors and others who use these tools.

E-portfolios continue to be primarily used by education majors, but the percentage of students overall who use them has remained very low since ECAR began asking about them in 2006. Use of simulations or educational games in courses remains modest. Other research also finds adoption rates of educational games and simulations to be comparatively low, despite a fairly robust ongoing discussion about the educational potential for digital game-based learning (DGBL) and multiuser virtual environments (MUVEs). Generally citing a lack of evidence demonstrating that games as learning environments are effective, experts have called for more research to understand the barriers to the adoption of these learning innovations in institutions.[2] A recent comprehensive study of the educational value of digital games did find, however, that some games have little educational value "not because they are games, but because they lack pedagogical design and game-based learning principles," and that game-based learning can be a very efficient tool if it is designed to reflect pedagogical and learning needs in a real educational setting.[3] It remains to be seen if this and other evidence will lead to more extensive use of educational games and simulations.

Web-Based Services and Student Collaboration

In February 2010, chief information officers, chief business officers, and industry leaders gathered in Tempe, Arizona, for a two-day EDUCAUSE/NACUBO Cloud Computing Workshop to explore what shape a higher education cloud might take and to identify opportunities and risks. The resulting white paper noted that cloud computing could offer institutions the flexibility for some enterprise activities to move above campus to providers that are faster, cheaper, or safer, and for activities to move off the institution's responsibility list to the "consumer" cloud (below campus), while still other activities can remain in house, including those that differentiate and provide competitive advantage to an institution.[4]

The emergence of these below-campus consumer cloud services that can potentially displace traditional PC-resident applications and storage with services delivered over the Internet motivated us to ask specific questions about use of web-based tools in courses. Recognizing that student respondents might not be familiar with cloud terminology, and the fact that cloud computing itself has definitions that go beyond the consumer cloud, we used the term "web-based" in our questions and will use this throughout our study.

Practically every student comes to campus with his or her own e-mail address and social networking presence, and a great many of them have many more accounts, memberships, and identities on numerous websites that enable them to conveniently access personal content at any time from any place. They store all types of information in places about which most of them know very little; they just know that they can find their friends on Facebook, send an e-mail via Hotmail, Gmail, or any number of other free Internet e-mail services, and do myriad other things that used to require physical storage and software installed on local computers.

Incoming college freshmen will likely be even more web-entrenched over the coming years as high schools around the nation are implementing web-based tools such as those offered by Google, IBM, and Microsoft, and budget constraints on public schools may fuel the adoption of these types of applications. Several states have already executed statewide agreements with Google to enable schools and districts to benefit from centralized resources such as deployment support and training materials, thus paving the way for schools to easily transition to Google Apps.[5] Microsoft offers free e-mail, instant messaging, and storage in the cloud to students via its Live@edu service and has an agreement with the Kentucky Department of Education to provide cloud-based communications and collaboration tools to more than 700,000 students, faculty, and staff statewide. Microsoft also recently announced a similar agreement with New York City schools.[6] In February 2010, IBM announced its own plan to work with K–12 school districts to make classrooms more intelligent and refresh outdated infrastructures through cloud computing by showcasing a cloud computing solution in North Carolina, and according to IBM, this is one of several such K–12 projects that the company is supporting.[7]

We wanted to know to what extent the generation in college today that has grown up with high-speed Internet, Google searching, MySpace, Facebook, and YouTube embraces such services and integrates them into the college experience. We asked if respondents were using several types of web-based tools (with examples to further describe the type of tools or services) for any of their courses during the quarter/semester of the survey. We also followed up this question with a slightly different list and asked if the respondent was collaborating or working with other students using the tools for any of their courses during the semester/quarter of the survey (see Table 6-2).[8]

None of the tools we named were being used in courses by a majority of respondents. But reported use was high enough to suggest that cloud-based resources are making substantial inroads into students' academic lives, particularly considering that our question referred only to the current quarter/semester. Six of the 15 tools we asked about were being used in courses by one-fourth or more of respondents, and among tool users, collaborative use with other students was common. We're unable to say whether students are assigned to use these tools by instructors or are choosing them on their own; we presume that both factors are at work.

Students also told us they were collaborating and communicating with others in their courses in our survey comments, including a student who complained about the institution CMS but went on to say that "the use of technology has been an overall positive experience at my school. I work with a number of different programs and tools to network with students, from Google Wave to Facebook. It's just much more convenient than the other available resources." Another student wrote, "Last year I had a professor utilize Google Docs and Google Pages, teaching us how to use both and then expecting us to be

Table 6-2. Students Using Web-Based Technologies in Courses the Quarter/Semester of the Survey and Those Using the Technologies Collaboratively in Courses

Web-Based Technology	Percentage Using the Technology (N = 36,950)	Number of Users	Percentage of Users Using the Technology to Collaborate in Courses
Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)	36.2%	13,368	53.0%
Wikis (Wikipedia, course wiki, etc.)	33.1%	12,228	30.7%
Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	29.4%	10,855	49.4%
College-related review/opinion sites (RateMyProfessors, College Prowler, Unigo, College Confidential, etc.)	27.1%	N/A	
Textbook publisher resource websites (Pearson, PrenticeHall, McGraw-Hill, etc.)	26.1%	9,654	23.2%
Video-sharing websites (YouTube, etc.)	24.3%	8,962	33.4%
Web-based calendars (Google Calendar, etc.)	17.4%	N/A	
Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)	17.2%	6,345	16.9%
Blogs	11.6%	4,279	37.6%
College study support (Cramster, Turnitin, Essay Checker, ShareNotes, etc.)	10.9%	N/A	
Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)	5.4%	1,996	32.9%
Micro-blogs (Twitter, etc.)	4.3%	1,605	40.2%
Web-based to-do lists/task-managers (Remember the Milk, Ta-da, etc.)	4.3%	N/A	
Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)	2.8%	1,053	30.5%
Online virtual worlds (Second Life, Forterra, etc.)	1.4%	527	29.4%

competent in using that technology. This I thought was terrific because there are a lot of outside applications for these tools."

Our findings suggest to us that students are gradually integrating these tools into their academic experience. Because today's high school and college-age students have been adopting social networking and content sharing at such high rates, higher education has an opportunity to leverage these technologies. There will be challenges, and experts point out that we need to truly understand which tools students are already embracing in their personal lives, how they actually use them, and their importance. By identifying ways to adopt these tools in order to remove potential technical barriers and introduce a sense of familiarity, institutions can better prepare students to make a connection with their campus and courses and let students know they understand their needs.[9]

Social Networking and Coursework

About 3 in 10 respondents (29.4%) told us they were using social networking websites in their courses the quarter/semester of the survey, and half (49.4%) of those students were using them to collaborate with other students during a course the semester/quarter of the survey (refer to Table 6-2). One student wrote in an open-ended comment that "Student groups on Facebook have been fairly helpful for me at times, and I've been able to organize and attend study sessions through Facebook events." Another found social networking helpful in learning a language:

"One of my Russian conversation courses uses Facebook and we are responsible for commenting on a forum every week, which helps us to use conversational Russian skills, stay up to date with Russian news and politics, and makes our language knowledge all the more semantic."

We also found signs that social networking was being used in support of coursework when we asked students how they used SNSs in general (not just during the current quarter/semester). More than half (51.5%) who used SNSs used them to communicate with classmates about course-related topics, although a far smaller percentage (7.9%) told us they used SNSs to communicate with instructors about course-related topics (refer to Table 5-4). As instructors experiment with ways to integrate social networking into their curriculum, some are finding that there is a line beyond which students will consider the contact an invasion of their private world. In 2008, an article in *The Chronicle of Higher Education* reported that a group of professors who recognized this issue coined the term "creepy treehouse" to describe technological innovations by faculty members that make students' skin crawl.[10]

Faculty do appear to be making some inroads into their students' networks, however. About 3 in 10 (31.9%) of the respondents who used SNSs said they had accepted current or previous college or university instructors as friends or contacts on social networking sites. We also found that class standing was a factor in whether respondents had accepted instructors into their networks: seniors tended to report it more than freshmen and community college students (see Figure 6-1). This makes sense, as more seniors use LinkedIn and told us they use SNSs for professional activities.

Other students also had varying opinions about connecting with instructors through SNSs. "I really appreciate it when my instructors are available on social media," a student told us. "If I send a question by e-mail, I don't know how soon my instructor will respond, and if I have a follow-up question, I have to start the process over again. If my instructor is on Facebook, I can see when they are available online and IM them or send them a message that I know they will see immediately." Other students were not as comfortable: "I like to keep my social life separate from school and work, so I tend to steer away from being 'Facebook friends' with professors, students, or coworkers," wrote one student. A student who felt the same way elaborated: "It creates unprofes-

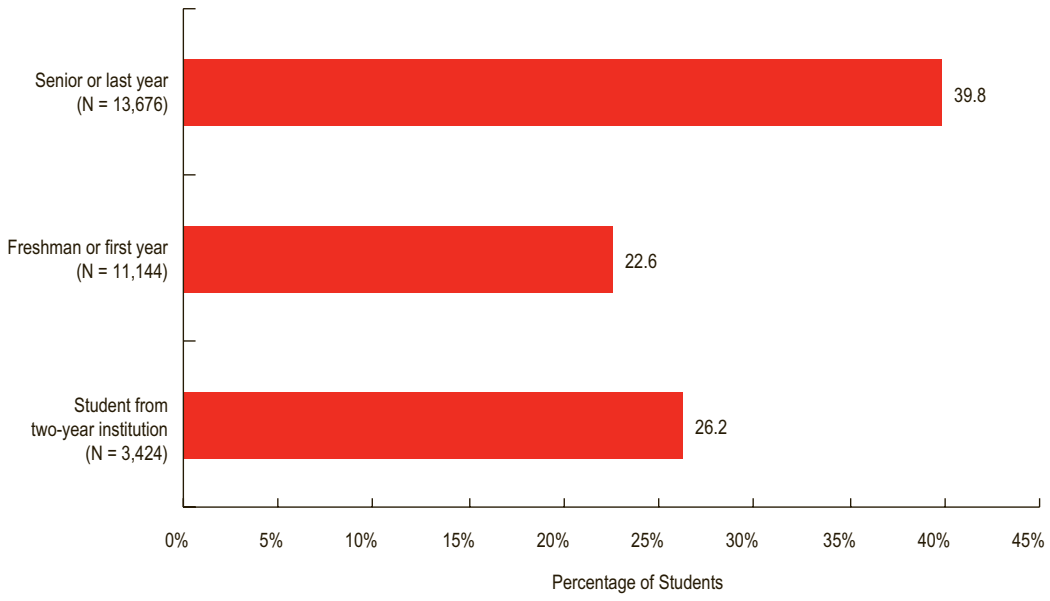


Figure 6-1. Friending Instructors on Social Networking Sites, by Class Standing

sional boundaries in the student/teacher relationship. Some of my classmates and a certain professor have been socially involved in Facebook and it has raised a lot of concern with other students because of apparent 'special treatment' between the professor and those students. Strict boundaries are difficult to set, but they are extremely necessary to avoid these inappropriate relationships."

We asked students if they would like to see greater use of social networking websites in their courses and found that just over a quarter of respondents said they would (see Figure 6-2). Respondents using an SNS in a course during the quarter/semester of the survey were more likely to say they would like to see greater use of SNSs in their courses. The students who said they would like to see more SNS use in courses indicated they used SNSs more often and for more activities in general. They also tended to fall into the early adopter or innovator technology adoption categories.

However, several student comments seem to indicate that use of Facebook or other common SNSs in a course was the aforementioned "creepy treehouse" type of strategy that they did not want to see employed. "If you're thinking about getting teachers and students to connect via Facebook, expect your expulsion rate to go through the roof," a student complained. Another, less blunt, comment was "I really don't want school (or my job) butting their nose in my social networking. If I am required to use those sites for school/work, I'll stop using them or create fake accounts to keep my recreation separate from my work/school/need-to-be-responsible-and-serious type activities. The idea of school admin. or anyone else in authority using my social networking to 'check up' on me freaks me out and I go to extremes to limit that."

Course or Learning Management Systems

Research from the 2009 EDUCAUSE Core Data Service report confirms a prevalence of course management system and learning management system (LMS) availability, as more than 90% of responding institutions confirmed they have at least one commercial, homegrown, or open source course

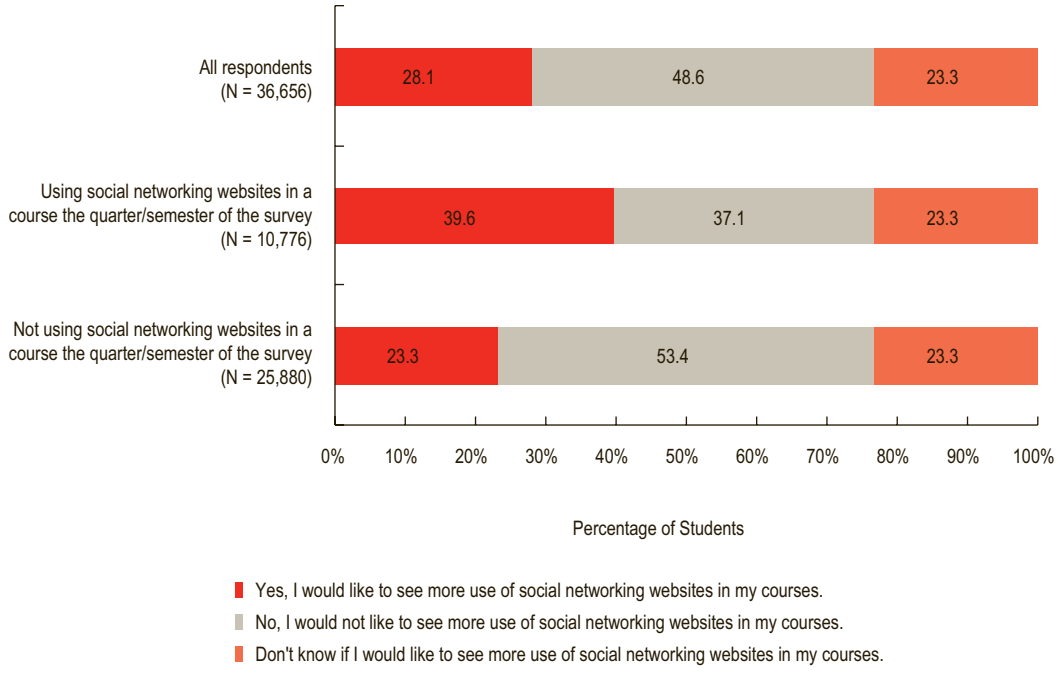


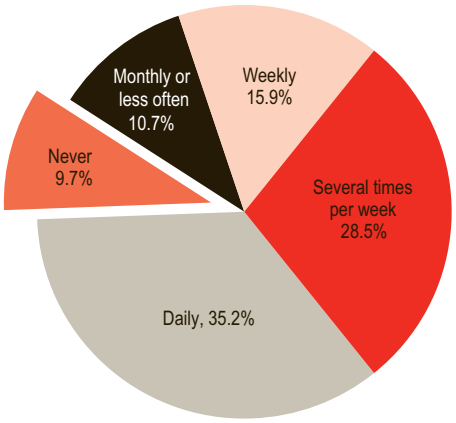
Figure 6-2. Percentage of Students Who Would Like to See Greater Use of Social Networking Websites in Their Courses

management system.[11] This is also reflected in our student study, as more than 9 in 10 respondents told us they have used a CMS (see Figure 6-3). Students appear to be relying on CMSs: more than a third of all respondents use a CMS daily and more than a quarter said they use them several times a week. However, just two-thirds of those students who did use CMSs told us they were using one during the quarter/semester of the survey, which seems to indicate that not all faculty are putting courses on CMSs. A majority of Core Data Service institutions indicated that their CMSs were used selectively by faculty, but the percentage that said their CMS(s) were ubiquitous and employed for all or nearly all courses increased from 38.1% in 2008 to 43.2% in 2009.

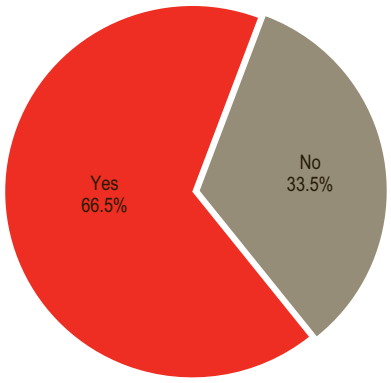
Our student study data reveals an increase in frequency and use of CMSs since 2008 (see Figure 6-4), and research from EDUCAUSE and other sources corroborates this increase.[12] Previous years' ECAR data indicated that more seniors had taken a class using a CMS than freshmen and community college students, but this year we find that there is no difference based on class standing. We do find, however, that lower percentages of community college students use CMSs than students from four-year institutions (77.8% versus 92.0%).

Of this year's respondents who have used a CMS, just over half said that their overall experience with them is positive or very positive (see Figure 6-5). However, we have found over the last few studies that the percentage of respondents who feel positive or very positive about the CMS experience has dropped from 76.5% in 2007 to 50.6% in 2010. Other research documents frustration by instructors and students regarding CMS design and performance issues. A 2008 study published in *The Quarterly Review of Distance Education* summarized research on the deficiencies of CMSs and noted that many students complained about both speed and ease of use.[13]

While we did not ask respondents what influenced the view they reported, a number of student comments in response to the final open-ended question in ECAR's 2010 survey complained about the institution's CMS. "Our CMS has a number of issues, including the ability to attach documents to send in for assignments through Firefox," wrote a student, who added that "It is also very difficult to navigate and there was little training." Another student said, "Our course management systems need to be streamlined for ease of use, for both students and professors," and explained



How often do you use course or learning management systems (a system that provides tools such as online syllabi, sample exams, and gradebook)? Examples include WebCT, Blackboard, Desire2Learn, Sakai, Moodle, or an institution-specific system. (N = 36,950)



Are you using a course or learning management system for any of your courses this quarter/semester? (N = 33,126)

Figure 6-3. Student Use of Course or Learning Management Systems

Figure 6-4. Change in Use of Course Management System from 2008 to 2010

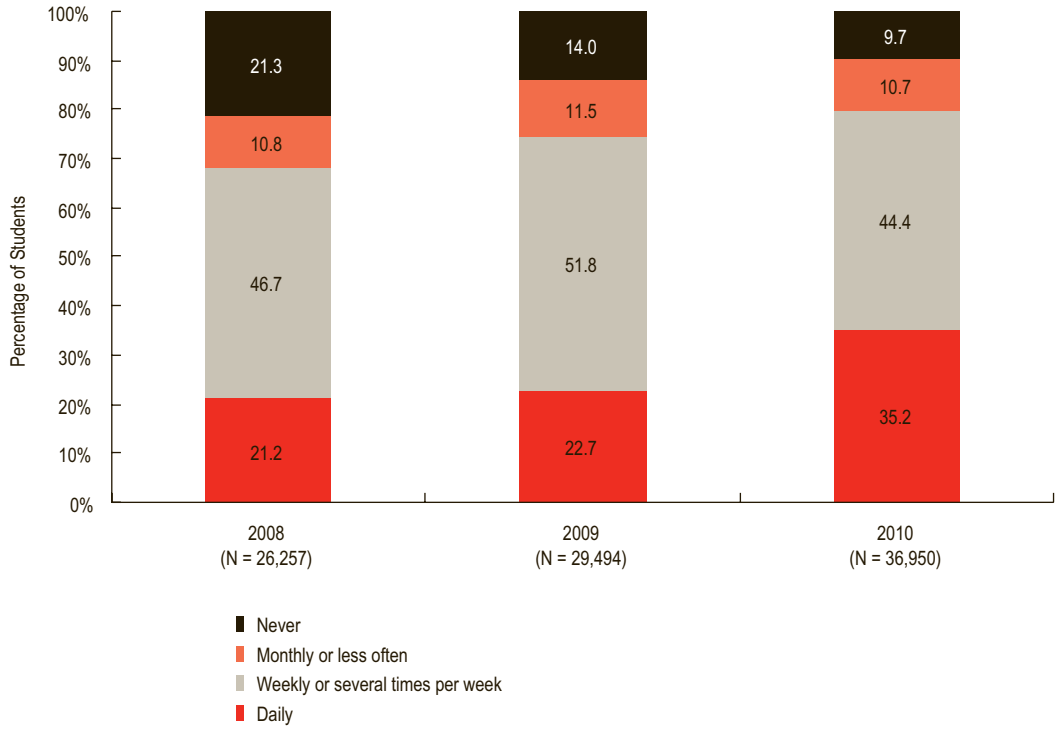
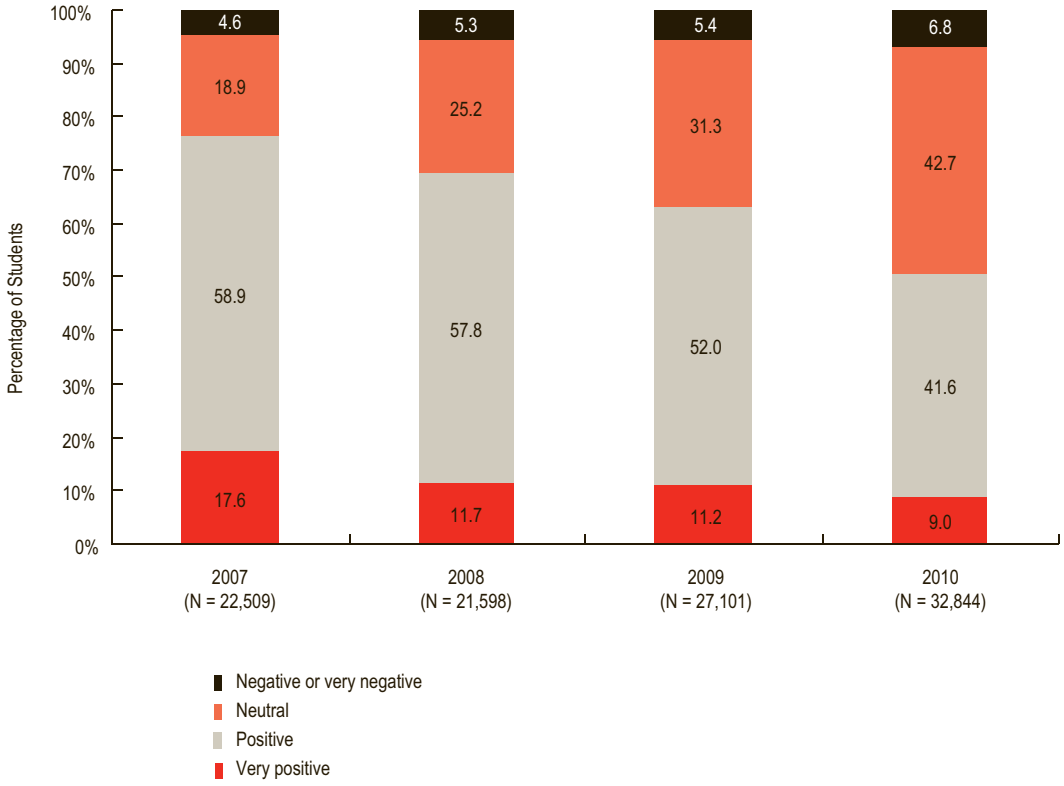


Figure 6-5. Positive/Negative Experience Using a Course or Learning Management System, 2007 to 2010*



** Includes only those respondents who used a CMS/LMS.*

that "Navigation and sharing of files can become ambiguously complex and hidden for less IT-savvy users."

Of course, quite a few students mentioned the convenience of using a CMS and were positive about its impact on their academic experience. A student who said "Our course management system is a great tool in case you have to miss class, because professors typically post lecture notes online" went on to say, "Additionally, it helps me stay organized (i.e., plan my schedule for the week) because professors post important dates (e.g., exam dates, homework due dates, furlough days)." And another said, "We use a course management system and it is really convenient. It makes it really easy to organize and plan for classes and communicate with instructors and peers. I think I'd probably be lost without it."

We continue to find that respondents who use a CMS more frequently report more positive experiences using it (see Figure 6-6). A student who wrote "I really like our course management system" explained that formal training would be very helpful and that it took some time to come to appreciate the system: "I know from experience as a freshman that it took me almost an entire semester before I knew about all of its features, and it would have really made the transition between high school and college smoother for me had I known about all the features from the beginning."

Availability of IT Services for Coursework

Consistently over the last three years when we have asked respondents whether they agreed with the statement "My institution's IT services are always available when I need them for my coursework," about half agreed or strongly agreed (52.2% this year), about a third were neutral (33.2% this year), and the remainder disagreed or strongly disagreed (14.6% this year). We have also consistently found that respondents' perception about institutional IT service

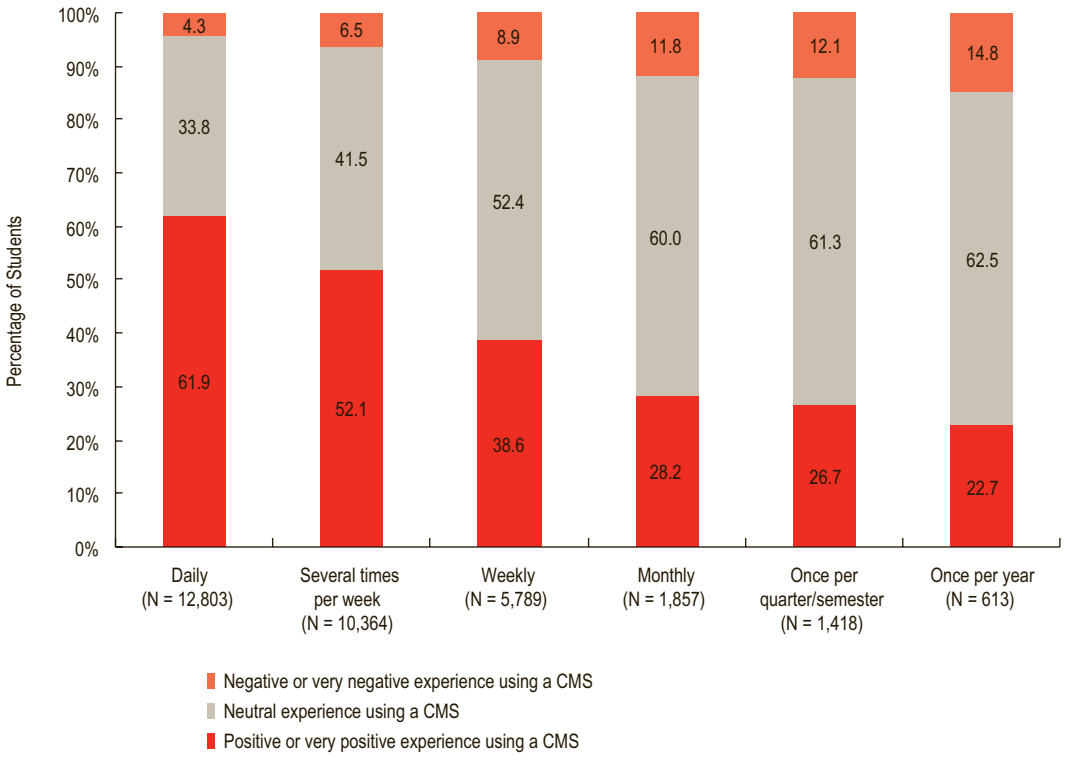


Figure 6-6. Positive/Negative Experience Using a Course or Learning Management System, by Frequency of Use

regarding coursework availability is related to their CMS experience. Students reporting a positive or very positive experience using a CMS were much more likely to agree about IT availability than those reporting a negative or very negative experience (e.g., for 2010, see Figure 6-7).

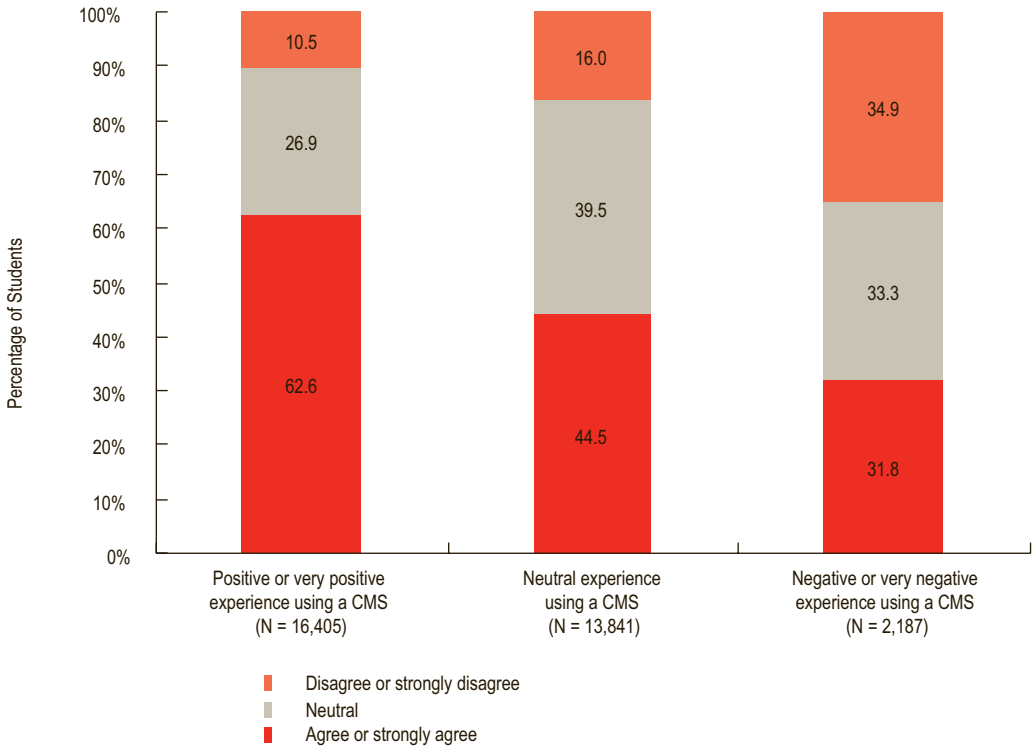
We found no meaningful difference in respondents' opinions about IT service availability on the basis of Carnegie class. In fact, the results are largely consistent across participating institutions, and a large majority of institutions show 50% or more of students agreeing or strongly agreeing that IT services are always available for coursework (see Figure 6-8). However, a majority of institutions had a mean response from students that was below the halfway point between neutral and agree, which seems like faint praise indeed. While few institutions received low marks from students regarding the availability of IT, these findings do indicate that from a student perspective, IT delivery could be better.

Students Taking Entirely Online Courses

Students who take fully online courses are more dependent than others on the availability of their institutions' IT infrastructure and services, which is one of the reasons we asked if respondents were taking an entirely online course during the quarter/semester of the survey. We were also curious to see if there has been an increase in the percentage of students who are taking entirely online courses since we asked this question two years ago in the 2008 survey. We did find an overall increase in students who were taking some or all of their courses entirely online, and in both years we found that part-time students were more likely to be taking entirely online courses (see Figure 6-9).

Because of the strong association between respondents' full-time/part-time status and whether they were from a community college, it is not surprising that we found that respondents from community colleges (AA institu-

Figure 6-7. IT Services Are Always Available for Coursework, by Positive/Negative Experience Using a Course or Learning Management System



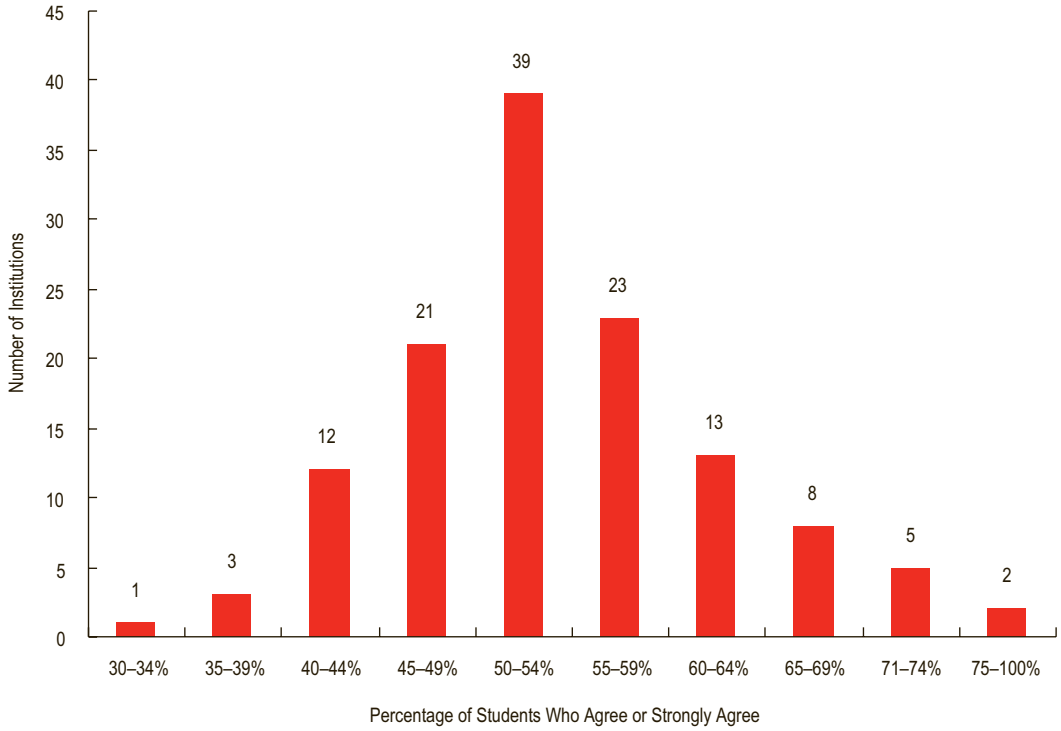


Figure 6-8. Distribution of Student Agreement That IT Services Are Always Available for Coursework (N = 127)

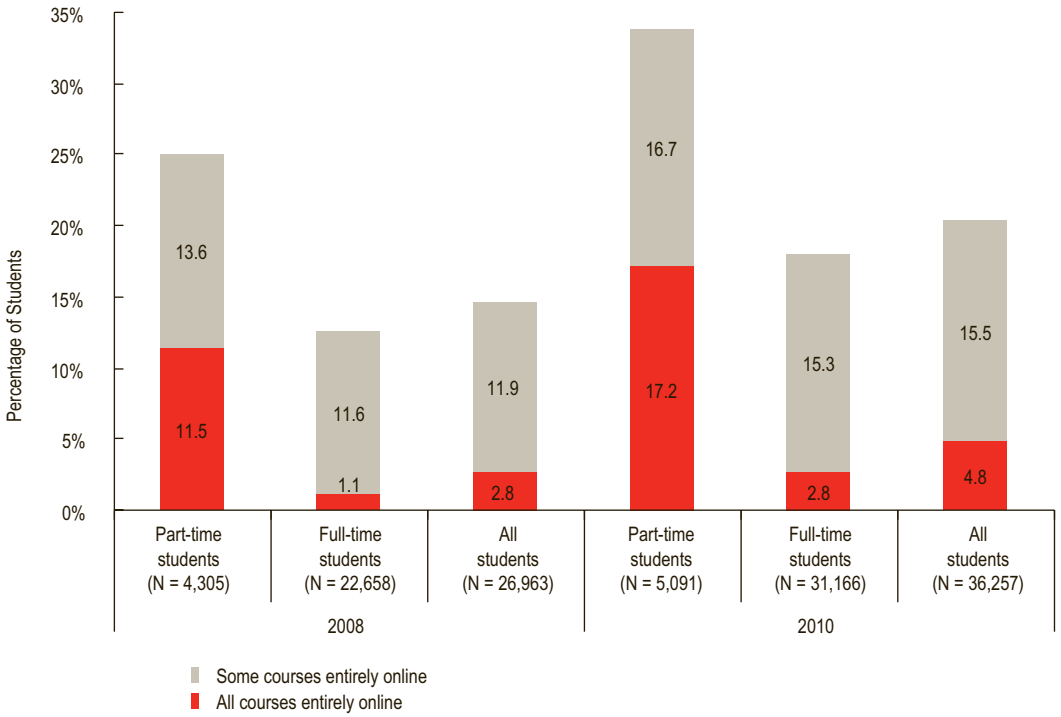


Figure 6-9. Entirely Online Courses during the Quarter/Semester of the Survey, by Part-Time/Full-Time Status, 2008 and 2010

tions) were more likely to be taking some or all of their courses entirely online than students from other institution types (see Figure 6-10). Well over a third of students from community colleges (38.6%) told us some or all of their courses were entirely online during the quarter/semester of the survey, while institutions from all other Carnegie classifications had fewer than a quarter of respondents who were taking any entirely online courses.

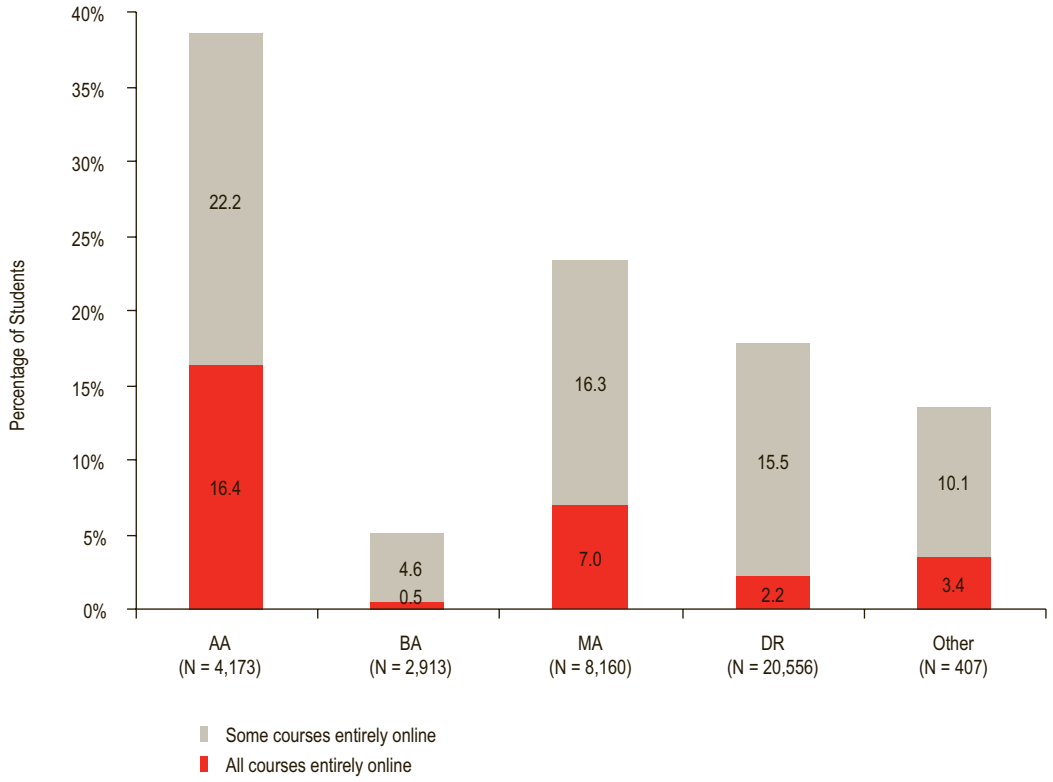
The 38.6% of community college students taking some or all of their courses entirely online compares with 17.9% of all the other respondents from four-year institutions.

Students who commented about online classes generally agreed on the convenience factor, but quite a few respondents implied they did not learn or engage as much as they did in face-to-face courses. "Online classes are great for time management, but I usually do not learn anywhere near as much from them," wrote a student who concluded, "I use them to earn credits. If I am interested in a subject I would prefer to take the class on campus." Many comments about online courses acknowledged the instructor's role. "It usually depends on the instructor," wrote one student. "I've taken many online classes, and sometimes they are helpful and other times they are more detrimental to my learning experience due to not being able to communicate with my instructors in person. Currently I'm taking 5/7 of my classes online, and at the moment I have no complaints. Last semester I only took two classes online and had a lot of difficulty. Like I said, it depends on the instructors."

Instructor Use of IT in Courses

It could be argued that the most important IT in a course is the human being responsible for communicating what is to be learned. Indeed, the effectiveness of the IT used to convey learning is only as successful as the instructor's ability to use it, and there is a wide range of technological expertise among those charged with teaching undergraduates. Students are as aware of this as anyone in higher education, and in our study many of them commented on their instructors. Of the 10,648 comments recorded in our survey, nearly 4,000 mentioned the words "professor," "instructor," or "teacher." We did not analyze every comment to determine the proportion of positive, negative, or neutral observations, but many students are obviously connecting instructors to IT when

Figure 6-10. Entirely Online Courses during the Quarter/Semester of the Survey, by Carnegie Classification



they are asked for comments about IT and their undergraduate experience. ECAR began asking questions about respondents' views on instructors' use of IT in courses in 2007. Over the next few years we modified the questions to get more granular data on student perceptions of instructors' skills with IT, effective use of IT, and training of students for the IT they use in courses by implementing a measurement scale to ask respondents to estimate how many of their instructors—almost none, some, about half, most, or almost all—met the criteria of the question. (For the current year's responses, see Figure 6-11.)

Student responses to these questions have been consistent from year to year, as have the distributions of responses across student demographics and types of institutions. Fewer than half of respondents have told us that "most" or "almost all" of their instructors met the criteria stated in each question about IT in courses every year we have asked. Other research has found that higher education instructors are still behind the curve when it comes to implementing IT in the classroom. The Faculty Survey of Student Engagement (FSSE) surveyed approximately 4,600 faculty members at 50 U.S. colleges and universities in the spring of 2009 and found that overwhelming majorities of faculty were not using IT tools such as collaborative editing software, blogs, plagiarism detection tools, student response systems, or video games/simulations/virtual worlds. The only technology the FSSE reported faculty using extensively was course management systems.[14]

Despite numerous experiments with leading-edge teaching technologies on campuses around the country, the FSSE findings suggest that many instructors continue to teach using old-school, lecture-based instruction. Clinging to outdated teaching practices amounts to educational malpractice, according to Chris Dede, a professor of learning technologies at Harvard University. "If you were going to see a doctor and the doctor said, 'I've been really busy since I got out of medical school, and so I'm going to

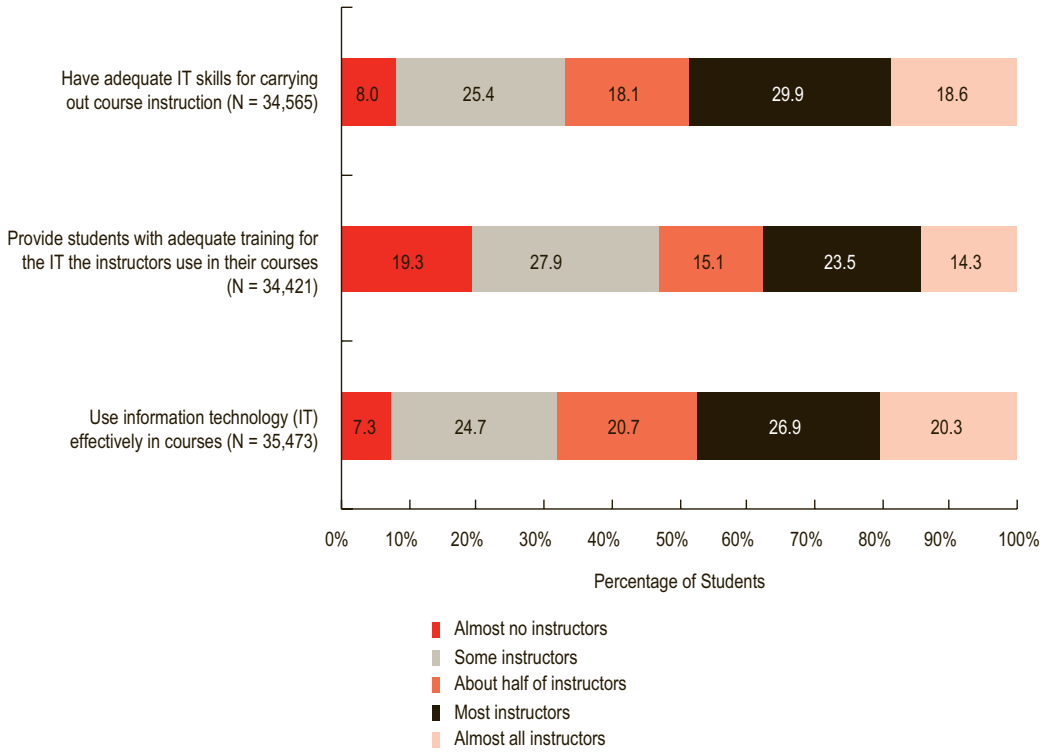


Figure 6-11. Instructors and IT in Courses

treat you with the techniques I learned back then,' you'd be rightly incensed," declared Dede in a recent article in *The Chronicle of Higher Education*. "Yet there are a lot of faculty who say with a straight face, 'I don't need to change my teaching,' as if nothing has been learned about teaching since they had been prepared to do it—if they've ever been prepared to." Dede helped write the National Educational Technology Plan issued by the U.S. Department of Education in early 2010, which states, "The challenge for our education system is to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures." Even the title of the report, *Transforming American Education: Learning Powered by Technology*, suggests that the country's teaching methods need a technology boost.[15]

Students also commented about their instructors' lack of technological experience in the open-ended question at the end of our survey. "Despite my efforts to stay positive, it really disappoints me that I have reached the level where I get excited when I come into a class and see that the professor actually knows how to switch in and out of a PowerPoint slideshow," a respondent shared. "I'm not asking for everyone to reach an expert level, but when I see seasoned professionals, often with doctoral degrees, fumbling around just to copy and paste files, I feel at a loss; not necessarily because time is being wasted while they struggle to turn the volume up on a YouTube video, but because of what could have been. If the experts in their fields were able to train their students in the technologies that are dominating their professional fields in the workforce universe, students would have better chances for employment, and would be able to talk with professionals in a way that shows they know the current status of the marketplace."

Of course students also commented about instructors who used technology effectively. For instance, "My Spanish class instructor used IT effectively—Skyping was helpful for learning language skills." And another wrote, "I find it much easier when instructors use programs like our course management system throughout the semester. The more they use it, like posting notes, handouts, grades, due dates, syllabus, etc., the better I am able to perform in class. Questions can be answered without having to wait to e-mail the professor or [for] the next class period."

Because so many course materials are made available online through the campus CMS and other venues and students have told us they use these materials, we began asking if students skipped classes when course material was available online in 2008. When asked to respond to the statement "I skip classes when materials from course lectures are available online" on a scale of strongly disagree, disagree, neutral, agree, and strongly agree, nearly two-thirds have consistently told us that they disagree or strongly disagree with the statement (see 2010 results in Figure 6-12). Other research has found that unlimited online access to lecture presentations did not negatively affect students' attendance rates, and students who downloaded slides before attending lectures were more likely to attend class.[16]

Quite a few students commented on attendance and online materials. A student who appreciated the convenience explained: "The availability of these materials does not discourage my attendance at all. In fact, I would say it encourages my attendance by making in-class time less stressful. Instead of having to struggle to write down everything the professor does or says, I am able to focus on simply trying to understand the lecture topic. I realize that some students might abuse such resources, but I implore you: please do not punish the rest of us for their irresponsible decisions."

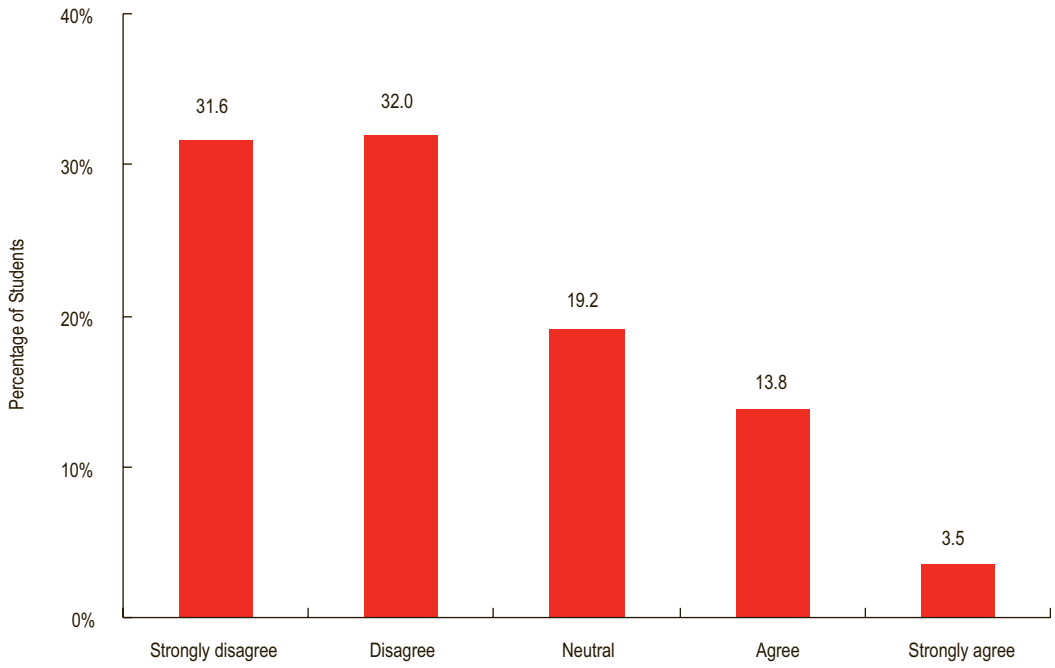


Figure 6-12. I Skip Classes When Materials from Course Lectures Are Available Online (N = 30,508)

How Students Like to Learn with Technology

In our 2007 survey, ECAR began asking a set of questions to better understand how students think about technologies as learning tools. Edward Dieterle, an expert in the psychosocial aspects of learning and teaching with current and emerging technologies, designed four of the questions, and in 2008 ECAR added a question about learning through creating or listening to podcasts or webcasts, which we broke down into two separate questions in this year's study (see 2010 results in Figure 6-13). The technologies described in these questions are means of transferring information and interacting with others, activities at the very core of the educational process. Because these newer, faster, more powerful ways to find, use, and exchange content are a critical part of the teaching and learning process in higher education, understanding how students think about them can help educators prepare effective learning environments.

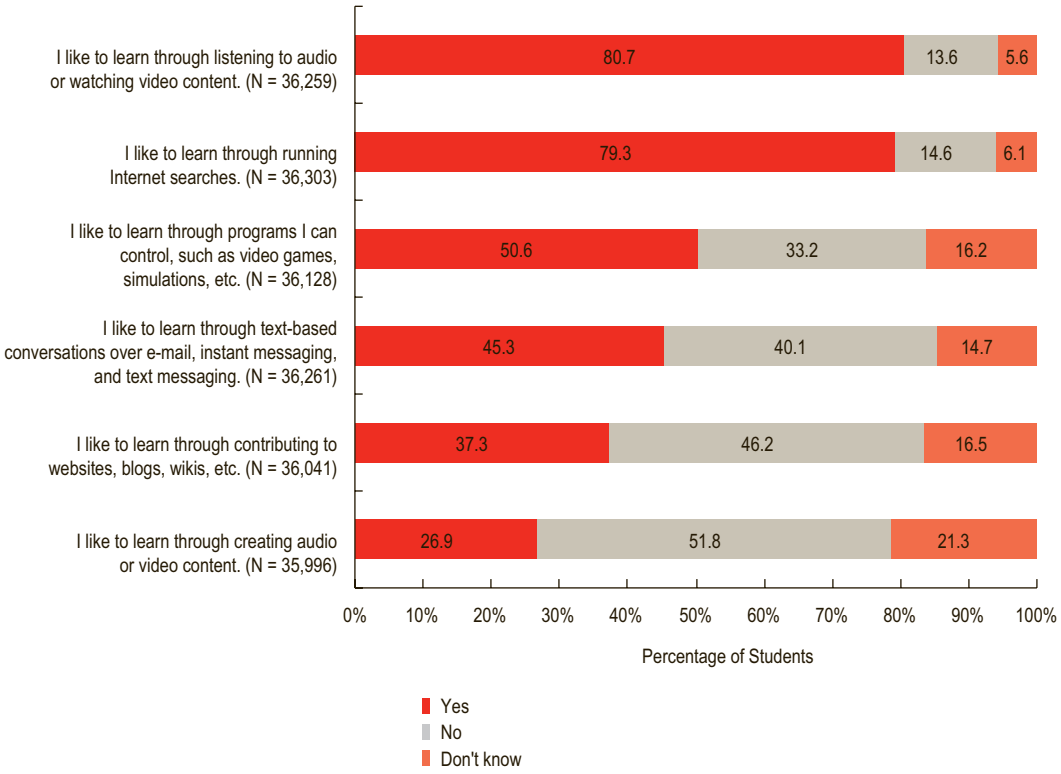
We have found almost no change over the last four years in how much respondents like to learn with the technologies in the original four questions designed by Dieterle. About 8 out of 10 respondents (79.3% this year) said they like to learn by running Internet searches; about half (50.6% this year) said they like to learn through programs they can control such as video games and simulations; fewer than half of respondents (45.3% this year) like to learn through text-based conversations over e-mail, IM, and text messaging; and slightly more than a third (37.3% this year) said they like to learn through contributing to websites, blogs, wikis, etc.

As in previous years, we found a meaningful association between respondents who identified themselves as early adopters of technology and liking to learn with all of the technologies we asked about, except for listening to audio/watching video content or running Internet searches. This may mean that these two types of learning tools are becoming more mainstream.

IT Outcomes Related to Student Success

Because IT is integrated with many student activities that influence college success, ECAR created four positive "outcome statements"

Figure 6-13. How Students Like to Learn with Technology



about the impact of IT in courses, and since 2008 we've asked students whether they agreed or disagreed with them. These questions are derived from literature generated by a National Postsecondary Education Cooperative (NPEC) three-year initiative to deepen higher education's knowledge of student success.[17] The dimensions of student success and the related questions we ask that seek to explore it are

- *Student engagement.* Student engagement has been consistently and positively linked to student success. ECAR asks if students agree with the statement "I get more actively involved in courses that use IT."[18]
- *Convenience.* Support for course activities is known to be associated with learning.[19] ECAR asks if students agree with the statement "IT makes doing my course activities more convenient."[20]
- *Learning.* ECAR includes an overall self-assessment by students, asking them if they agree with the statement "The use of IT in my courses improves my learning."
- *Workplace preparedness.* Because students expressed their desire to be prepared for the technologies required of the workforce upon graduation, ECAR asks students if they agree with the statement "By the time I graduate, the IT I have used in my courses will have adequately prepared me for the workplace."

The distributions of responses to these outcome questions are shown in Figure 6-14. As in previous years' studies, the responses tell us that convenience is the clear front-runner. As one student wrote in this year's comments, "Information technology is a powerful resource and is used effectively by most instructors at my school. This makes for a convenient way to follow up on homework, missed information, and an overall confidence in knowing exactly what is going on from day to day in each class." Another said, "IT has made life much more convenient. It allows flexibility as a student, especially the course

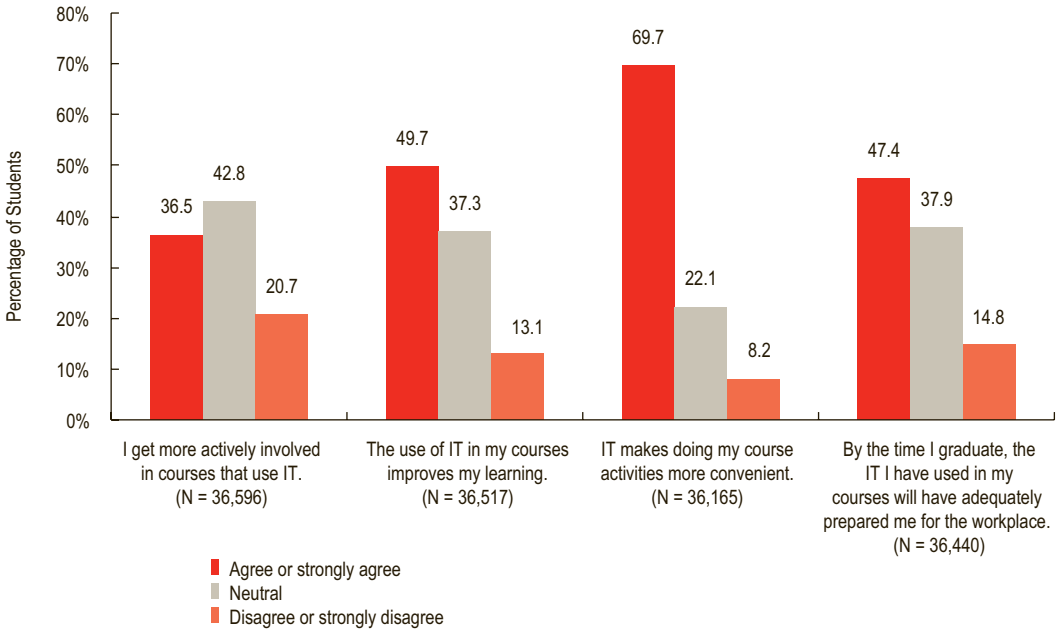


Figure 6-14. Student Perceptions about IT in Courses

management system. It makes the classroom accessible all the time, and as a student paying money to a university, this makes me feel like the university is thinking about what I need to make learning easy and accessible all the time. I have had a lot of positive experiences with IT in our classrooms and every single course has required me to use it in some form."

About half of respondents agreed or strongly agreed that the use of IT in courses improves their learning, and half also agreed or strongly agreed that by the time they graduate, the IT they have used in courses will have adequately prepared them for the workplace. Slightly more than a third of respondents agreed or strongly agreed that they get more actively involved in courses that use IT.

Surprisingly, seniors were no more likely to agree or disagree with the statement about workforce preparedness than were freshmen. In the comments a student who expected to graduate in August 2010 said, "While I feel the instructors I've encountered through my college career were/are very knowledgeable and do a good job lecturing, the hands-on element and necessary equipment in the curriculum is definitely lacking. I'm currently researching other colleges/universities to pursue a degree in computer science or IT. A deciding factor in my next educational pursuit will definitely be a college that draws upon a hands-on learning approach. In the technology field, it is especially imperative to utilize real-world experience, not just lecture, to be effectively prepared for the workplace."

Response patterns for the ECAR outcome statements about the impact of IT on courses do not vary meaningfully across demographic factors including gender, age, class standing, GPA, part-time versus full-time enrollment status, on-campus versus off-campus residence, Carnegie class, institution size, and private versus public status.

This year, respondents commented both positively and negatively on how IT in courses impacts their learning. One of the more interesting observations signified frustration: "Compared with my college experience 10 years ago, I feel that integrating IT into coursework makes it unnecessarily complicated. Screen names, passwords, pin numbers, a different website for each and every department, different programs to learn for specific classes that you'll never use again.... It's too much. Keep it simple. I'd rather spend my time and money learning about the informa-

tion pertaining to my classes than wasting time wading through ever-increasing, always changing red tape. Books. Instructors. Papers. That's all you need."

Preference for IT in Courses

What may be the ultimate question regarding IT in a student's experience is a question ECAR began asking the first year of the student survey in 2004: how much IT do they prefer in their courses? Using a 5-point scale from "no IT" to "exclusive IT," we have found that responses over the last seven years have been remarkably consistent. Majorities of students have told us every year that they prefer only a "moderate" amount of technology in their courses, and this year is no exception; but this preference is closely linked with technology adoption practice: those with earlier-adoption preferences tend to prefer more IT than those with later-adoption preferences (see Figure 6-15). Males, who are more likely to see themselves as innovators or early adopters, expressed a stronger preference for IT in courses, with exactly a third (33.3%) preferring extensive or exclusive IT in courses, compared with 20.1% of females.

It is surprising that the desire for moderate IT in courses has been this consistent over the years when students' use of technology in their personal lives, such as text messaging, social networking, and using mobile devices, has increased, as discussed in the previous chapters. One possible explanation that we posited last year was that what respondents in 2004 considered a "moderate amount of IT" may be quite different from what today's respondents consider moderate. Would a mainstream adopter in 2004 think that watching videos on the Internet and discussing them via Facebook chat with a classmate was a moderate or an extensive use of IT in a course? The current prevalence of hybrid courses that utilize CMSs, video websites, and other tools as supplements to face-to-face courses might have been viewed as extensive use by mainstream adopters of a

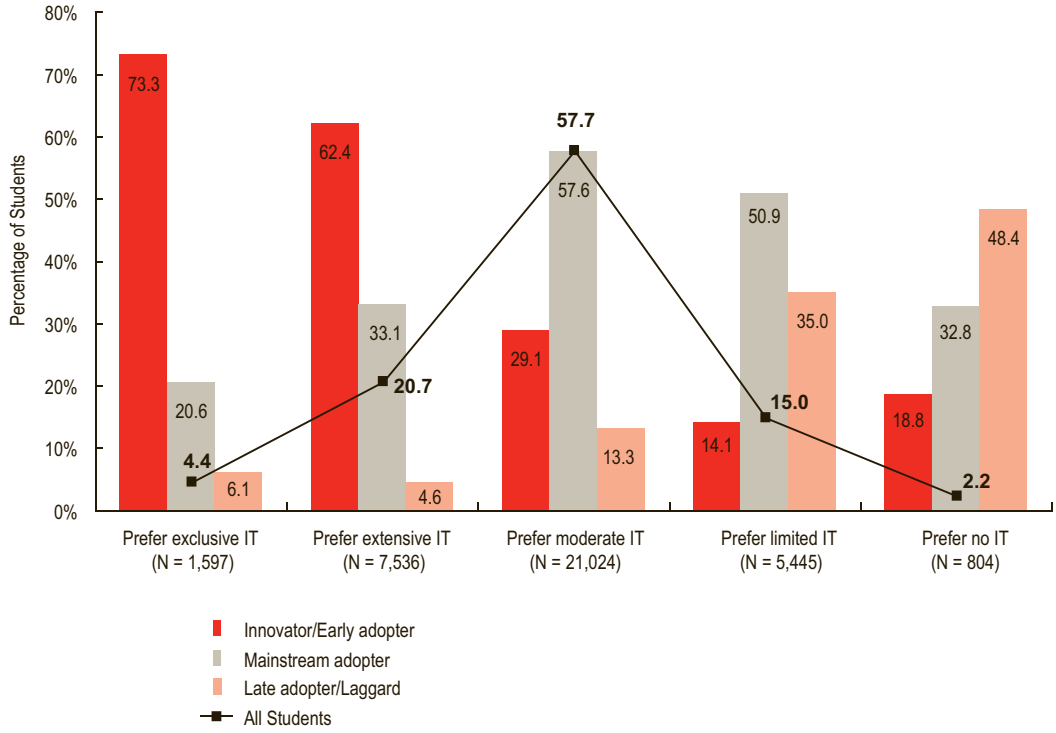


Figure 6-15. Preference for IT in Courses, by Technology Adoption and Overall (N = 36,406)

few years ago, whereas today's mainstream adopters may consider them to be just the right, or moderate, amount of IT in their courses. As users encounter and make use of IT without even thinking about it, the oft-mentioned "commoditization of IT" could be shaping just what a student considers to be innovator-level or laggard-level technology adoption as well as just what "moderate" might mean when asked how much IT they prefer in courses.

Although the ubiquity of IT may be contributing to what students consider to be a moderate level of technology in a course, many students clearly prefer a low amount of IT, and several respondents said that IT could never replace direct personal contact with an instructor. "My one entirely online course this semester is so generic—it is supposed to be an orientation for study abroad and has nothing much to do with what my trip involves. Maybe I'm wrong, but I feel that if this course was happening in a classroom, the teacher could adapt the material to fit the occasion a little better. Frankly, despite the much greater convenience of online learning (I live 50 miles from campus and commute three times a week), I prefer face-to-face learning."

Some commented about the use of technology in both society and in their academic experience and said that they consciously attempted to limit its role in their lives. "I tried taking a course online and ended up dropping it within two weeks because I didn't find it to be user friendly. It seemed disorganized. In addition, I need the personal contact. I am glad I dropped the online course. I got to meet new people and a great professor. It seems we are running towards a world where people are forgetting how to talk to each other face to face. Why would we ever be in a rush to do that?"

Whatever the underlying reasons, ECAR student survey respondents' views of IT in courses suggest that they still want face-to-face interactions in the classroom and with faculty. Perhaps this student summed it up best: "I believe it is important to remember that the classroom and the instructor cannot be replaced with computers and online course-teaching completely. I realize many students prefer online and it is something needed because without the opportunity some students could not attend college. The online courses are what the students make of them, but when offered to immature students they opt for the quickest and easiest way to get the credits, and often it means shortcuts and cheating. This is not a good education. The United States continues to slide behind other countries in education, so a good strategy is to combine technology with a more traditional approach."

Endnotes

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11. EDUCAUSE Core Data Service (Boulder, CO: EDUCAUSE 2009), http://www.educause.edu/coredata/. Finding was generated directly from the Core Data.
12. This is a continuation of a trend first reported in the 2007 ECAR student study that found an increase from 2005 to 2007. Shannon D. Smith, Gail Salaway, and Judith Borreson Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2009* (Research Study 6, 2009) (Boulder, CO: EDUCAUSE Center for Applied Research, 2009), available from http://www.educause/edu/ecar/; John Camp, Peter DeBlois, and others, "Current Issues Survey Report, 2007," *EDUCAUSE Quarterly* 30, no. 2 (2007), http://educause.edu/apps/eq/eqm07/eqm0723.asp; Casey Green, *The Campus Computing Project* (November 2009), http://www.campuscomputing.net/sites/www.campuscomputing.net/files/CampusComputing2009_1.pdf; and EDUCAUSE Core Data Service, (Boulder, CO: EDUCAUSE, 2009), http://www.educause.edu/coredata/. Finding was generated directly from the Core Data.
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18. The National Survey of Student Engagement defines student engagement to mean student participation in course activities that are provided for their learning and personal development. See The National Survey of Student Engagement, "Engaged Learning: Fostering Success for All Students" (NSSE, 2006), http://nsse.iub.edu/NSSE_2006_Annual_Report/docs/NSSE_2006_Annual_Report.pdf; and George D. Kuh et al., *What Matters to Student Success: A Review of the Literature*, Commissioned Report for the National Symposium of Postsecondary Student Success: Spearheading a Dialog on Student Success (National Postsecondary Education Commission, 2006), http://nces.ed.gov/npec/pdf/Kuh_Team_Report.pdf. These themes are discussed and references provided throughout this paper.
19. Ibid.
20. For the 2005 through 2007 surveys, there were several questions about different aspects of convenience, such as providing support for communication and collaboration, prompt feedback from instructors, and controlling of course activities. These questions received similar responses, so in 2008 they were combined into one question/statement about convenience: "IT makes doing my course activities more convenient."

Appendix A

Acknowledgments

We express our sincere appreciation to the following individuals who helped us make this study possible. Their contributions include securing institutional approval to do the study at their institution, selecting a sample of students to invite to participate and inviting them to do so, recruiting students to participate in focus groups, and performing a variety of other tasks.

Adams, Nancy—Harrisburg University of Science and Technology
Adelaine, Michael—South Dakota State University
Alarcon, Christy—Maricopa Community College System
Albert, J. L.—Georgia State University
Ambur, Roberta—The University of South Dakota
Anderson, Rick—University of North Dakota
Antolovic, Laurie—Indiana University
Backscheider, Nickolas—Auburn University
Baker, Hillary—California State University, Northridge
Ball, Katherine—Michigan State University
Barber, Patricia—University of North Carolina Charlotte
Barton, Lindsey—Brandeis University
Bauer, Kati—University of Michigan–Ann Arbor
Bedi, Param—Bucknell University
Beyer, Jessica—Embry-Riddle Aeronautical University
Bianchi, Julius—California Lutheran University
Bielec, John A.—Drexel University
Bixler, Cindy—Embry-Riddle Aeronautical University
Blackman, Ashley—Red River College
Blanton, Sharon—Portland State University
Bohlmann, Nathan—Clemson University
Bos, Joleen—The University of South Dakota
Brewer, Laura—Arizona State University
Brynes, Abby—Coppin State University
Bucher, John—Oberlin College
Burrell, Steven—Georgia Southern University
Carr, Matt—Hamilton College
Caruso, Judy Borreson—University of Wisconsin–Madison
Chancellor, Beth—University of Missouri–Columbia
Chester, Tim—Pepperdine University
Childs, Dee—Louisiana State University
Chu, Helen—University of Oregon
Colaric, Susan—Saint Leo University
Collura, Michael—The Ohio State University Mansfield
Cooper, Jeff—Harrisburg University of Science and Technology
Cronin, Patrick—Bridgewater State College

Crowe, Mary—University College Dublin
Culver, Steven—Virginia Tech
Dahlberg, Jim—Wisconsin Indianhead Technical College
Dalton, Genevieve—University College Dublin
Deau, Andrea—Madison Area Technical College
Dehoney, Joanne—The Ohio State University
Denman, Chip—University of Maryland
Draude, Barbara—Middle Tennessee State University
Drechsel, Carol—University of North Dakota
Drummond, Pam—California State University, Fullerton
Duffy, William—Skidmore College
Dunnavant, Susan—Furman University
Duszynski, Tom—Wayne State University
Eckhardt, Chip—University of Wisconsin–Eau Claire
El-Haggan, Ahmed—Coppin State University
Ellis, Carolyn—University of Texas at San Antonio
Elmore, Garland C.—Indiana University–Purdue University Indianapolis
Elwell, Cheryl—Clark University
Estes, Alicia—University of Arkansas
Fisher, Beth—Washington University in St. Louis
Fowler, Craig—Western Carolina University
Francis-Chewning, Dawn—Emory University
Frank, Debra—The College of New Jersey
Frazier, Nancy—Bucknell University
Fritz, John—University of Maryland, Baltimore County
Gadikian, Jake—Bryant & Stratton College
Garrett, L. Paul—North Greenville University
Gilbert, Larry—California State University, Sacramento
Gilbert, Linda—Georgia Gwinnett College
Gonnick, Lev S.—Case Western Reserve University
Haffner, Larry—Webster University
Hanson, Perry O. III—Brandeis University
Harris, Donald E.—University of Oregon
Hidalgo, Rommel—California State University, Fullerton
Hisle, W. Lee—Connecticut College
Hoover, Dana—Pepperdine University
Hotchkiss, Larry—University of Delaware
Houston-Brown, Clive—University of La Verne
Huish, Darrel—Maricopa Community College District
Hurley, Douglas E.—The University of Memphis
Huskamp, Jeffrey—University of Maryland
Iroff, Linda—Oberlin College
Jackson, Doug—California State University, Sacramento
Jacobson, Carl—University of Delaware
Jasper, Joanna L.—Catawba College
Johnston, Tyler—Butler University
Jones, Denise—Ball State University
Jones, Kristine—Colorado College
Justice, Debbie—Western Carolina University
Kahle, David J.—Tufts University
Kearns, Richard—University of Tulsa
Kelley, Sherry—Eastern Michigan University
Khaneja, Gurvinder—Passaic County Community College
Kincaid, Scott—Butler University
King, Beverly—University of North Carolina at Pembroke
Kinley, Edward—Indiana State University
Knaapen, Laura—University of Wisconsin–Oshkosh
Kossuth, Joanne M.—Franklin W. Olin College of Engineering
Kraemer, Ron—University of Wisconsin–Madison
Kral, Kathy—University of West Georgia
Kunnen, Eric—Grand Rapids Community College
Ladner, Betty—University of North Carolina Charlotte
Landry, Stephen G.—Seton Hall University
Lane, Cara—University of Washington

Lea, Lucinda T.—Middle Tennessee State University
Ledbetter, Phil—Embry-Riddle Aeronautical University
Leese, Danita—California State University, Northridge
Lehmann, Ernest—Bryant & Stratton College
Levy, Samuel J.—University of St. Thomas
Lindle, Gary—Clemson University
Maas, Bruce—University of Wisconsin–Milwaukee
Malm, Loren—Ball State University
Marlock, Kathy—Webster University
McClelland, Kathy—Auburn University
McConalogue, Barbara—Dublin City University
McCreadie, Maureen—Bucks County Community College
McGill, Scott—Michigan State University
McGuire, Jane—University of New Mexico
Mendola, Richard A.—Emory University
Miller, Fred—Furman University
Miller, Laura—Messiah College
Moore, Anne H.—Virginia Tech
Morooney, Kevin—The Pennsylvania State University
Nickel, Lisa—University of North Carolina Charlotte
Nielsen, Brian—Northwestern University
Noriega, Jose—University of Wisconsin–Parkside
Orr, Robert—University of North Carolina at Pembroke
Parker, Ron—Brazosport College
Pepping, Betsy—The University of Arizona
Petrides, Claire—University of Baltimore
Pokot, Elena—University of Wisconsin–Whitewater
Rahman, Mohammed—The Ohio State University
Rehm, Roger—Central Michigan University
Rew, David—Red River College
Richichi, Mike—Drew University
Robb, Terry—University of Missouri–Columbia
Rodriguez, Lisa—University of La Verne
Rosenberg, Eric—Stevens Institute of Technology
Rowe, Theresa—Oakland University
Russell, Mike—Georgia State University
Sacher, Dick—University of Delaware
Samuel, John—Indiana University
Sanders, Jerry—Macalester College
Sandler, Martin—Seton Hall University
Sannier, Adrian—Arizona State University
Sawasky Joseph—Wayne State University
Schaefer, Beth—University of Wisconsin–Milwaukee
Schaeffer, Sandy, III—The University of Memphis
Schaffer, Connie J.—Eastern Michigan University
Scheuermann, Mike—Drexel University
Schmidt, Jeffrey Robert—Towson University
Schoeler, Mary—University of Wisconsin–Superior
Schoenefeld, Dale—University of Tulsa
Sellitto, Michael—Bryant & Stratton College
Seraichick, Laura—Keene State College
Siesing, Gina—Tufts University
Sipher, Justin—Skidmore College
Smallen, David L.—Hamilton College
Smith, Elizabeth—University of St. Thomas
Sommer, Alison—Macalester College
Sorensen, Roger L.—College of Saint Benedict/Saint John's University
South, Sue—The University of Arizona
Speller, Lesley—University of Arkansas
Splittgerber, Ken—University of Wisconsin–Oshkosh
Sreebny Oren—University of Washington
Stack, David—University of Wisconsin–Milwaukee
Stern, Nadine—The College of New Jersey
Suess, Jack—University of Maryland, Baltimore County
Taylor, Bob—Northwestern University
Teegan, TJ—University of Wisconsin–La Crosse
Temple, Lori L.—University of Nevada, Las Vegas

Tillman, John—University of Wisconsin–La Crosse
Trinko, Lynn—The Ohio State University at Lima Campus
Turgeon, Pennie—Clark University
Veselsky, Lora—Case Western Reserve University
Vogel, Kim—Central Michigan University
Voss, Brian—Louisiana State University
Walsh, Theresa—Indiana University–Purdue University Indianapolis
Watson, Amanda—Connecticut College
Weiler, Jan—Washington University in St. Louis
White, Marshall—University of New Hampshire
Williams, Vicki—The Pennsylvania State University
Wilson, Bryan—University of Texas at San Antonio
Winters, Terri—University of New Hampshire
Wong, Victor K.—University of Michigan–Ann Arbor
Wood, Judith—University of Baltimore
Wynd, Matt—Towson University
Yerkes, Kathryn—University of Scranton
Young, Joanna—University of New Hampshire
Zeberio, Miren Berasategi—Universad de Deusto

Appendix B

Students and Information Technology in Higher Education, 2010: Survey Questionnaire

1. **How old are you?** *We may only survey students 18 years or older. Required.*

   Dropdown list including Under 18 and 18 through 99. Respondents under 18 must exit the survey.

2. **To enter the drawing for gift certificates, please enter your e-mail address.**

   *Optional.*_____

3. How old is your:

	Don't own	Less than one year old	One year old	Two years old	Three years old	Four years old	More than four years old
a. Personal desktop computer							
b. Personal full-sized laptop computer							
c. Personal small, lightweight netbook computer							
d. Personal dedicated e-book reader (Amazon Kindle, Sony Reader, Barnes & Noble nook, etc. — not iPhone or other devices whose primary function is not as an e-book reader)							

4. **Approximately how many hours each week do you spend actively doing Internet activities for school, work, or recreation?**

   Dropdown list including Less than 1, 1 to 168, in 1-hour increments.

5. How often do you do the following for school, work, or recreation?

	Never	Once per year	Once per quarter or semester	Monthly	Weekly	Several times per week	Daily
a. Instant message							
b. Text message							
c. Use the college/university library website							
d. Spreadsheets (Excel, etc.)							
e. Presentation software (PowerPoint, etc.)							
f. Graphics software (Photoshop, Flash, etc.)							
g. Audio-creation software (Audacity, GarageBand, etc.)							
h. Video-creation software (MovieMaker, iMovie, etc.)							
i. Online multi-user computer games (*World of Warcraft, RuneScape, Lineage*, poker, etc.)							
j. Online virtual worlds (Second Life, Forterra, etc.)							
k. Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)							
l. Voice over Internet Protocol (VoIP) from your computer (Skype, etc.)							
m. Follow or update micro-blogs (Twitter, etc.)							

6. How often do you contribute content to the following for school, work, or recreation?

	Never	Once per year	Once per quarter or semester	Monthly	Weekly	Several times per week	Daily
a. Wikis (Wikipedia, course wiki, etc.)							
b. Blogs							
c. Videos to video-sharing websites (YouTube, etc.)							

7. Do you own a handheld device that is capable of accessing the Internet (whether or not you use that capability)? Examples include iPhone, Treo, BlackBerry, other Internet-capable cell phone, iPod touch, PDA, Pocket PC, etc. *Required.*

[ ] No, and I don't plan to purchase one in the next 12 months. *Go to 10.*

[ ] No, but I plan to purchase one in the next 12 months. *Go to 10.*

[ ] Yes. *Go to 8, 9, 10.*

[ ] Don't know. *Go to 10.*

8. How often do you use the Internet from your handheld device? *Required.*

[ ] Never (do not use the Internet capability). *Go to 10.*

[ ] Once per year. *Go to 9, 10.*

[ ] Once per quarter/semester. *Go to 9, 10.*

[ ] Monthly. *Go to 9, 10.*

[ ] Weekly. *Go to 9, 10.*

[ ] Several times per week. *Go to 9, 10.*

[ ] Daily. *Go to 9, 10.*

9. Which of these Internet activities do you do from your handheld device? *Check all that apply.*

[ ] a. Instant message

[ ] b. E-mail

[ ] c. Follow or update micro-blogs (Twitter, etc.)

[ ] d. Use social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)

[ ] e. Check information (news, weather, sports, specific facts, etc.)

[ ] f. Read or contribute to blogs

[ ] g. Use maps (find places, get directions, or plan routes)

[ ] h. Conduct personal business (banking, shopping, etc.)

[ ] i. Use photo-sharing websites (Flickr, Snapfish, Picasa, etc.)

[ ] j. Watch mobile TV

[ ] k. Download/stream music

[ ] l. Download or watch videos online

[ ] m. Download or play games online

10. Which best describes your preference?

[ ] I prefer taking courses that use *no* information technology.

[ ] I prefer taking courses that use *limited* information technology.

[ ] I prefer taking courses that use a *moderate* level of information technology.

[ ] I prefer taking courses that use information technology *extensively.*

[ ] I prefer taking courses that use information technology *exclusively.*

11. What is your skill level for the following?

	Not at all skilled	Not very skilled	Fairly skilled	Very skilled	Expert
a. Using the college/university library website					
b. Spreadsheets (Excel, etc.)					
c. Presentation software (PowerPoint, etc.)					
d. Graphics software (Photoshop, Flash, etc.)					
e. Computer maintenance (software updates, security, etc.)					
f. Using the Internet to effectively and efficiently search for information					
g. Evaluating the reliability and credibility of online sources of information					
h. Understanding the ethical/legal issues surrounding the access to and use of digital information					

12. Are you using the following for any of your courses this quarter/semester?
Check all that you are using.

[ ] a. Spreadsheets (Excel, etc.)
[ ] b. Presentation software (PowerPoint, etc.)
[ ] c. Graphics software (Photoshop, Flash, etc.)
[ ] d. Audio-creation software (Audacity, GarageBand, etc.)
[ ] e. Video-creation software (MovieMaker, iMovie, etc.)
[ ] f. Programming languages (C++, Java, etc.)
[ ] g. Course lecture podcasts or videos
[ ] h. E-portfolios
[ ] i. Discipline-specific technologies (Mathematica, AutoCAD, STELLA, etc.)
[ ] j. Instant messaging
[ ] k. Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)
[ ] l. Wikis (Wikipedia, course wiki, etc.)
[ ] m. Blogs
[ ] n. Online virtual worlds (Second Life, Forterra, etc.)
[ ] o. College/university library website
[ ] p. Simulations or educational games
[ ] q. E-books or e-textbooks
[ ] r. Clickers or student response systems

13. Are you using the following web-based tools for any of your courses this quarter/semester? *Check all that you are using.*

[ ] a. Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)

[ ] b. Video-sharing websites (YouTube, etc.)

[ ] c. Web-based to-do lists/task-managers (Remember the Milk, Ta-da, etc.)

[ ] d. Web-based calendars (Google Calendar, etc.)

[ ] e. Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)

[ ] f. Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)

[ ] g. College-related review/opinion sites (RateMyProfessors, College Prowler, Unigo, College Confidential, etc.)

[ ] h. College study support (Cramster, Turnitin, Essay Checker, ShareNotes, etc.)

[ ] i. Textbook publisher resource websites (Pearson, PrenticeHall, McGraw-Hill, etc.)

[ ] j. Micro-blogs (Twitter, etc.)

[ ] k. Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)

14. Are you collaborating or working with other students using any of the following web-based tools for any of your courses this quarter/semester? *Check all that you are using.*

[ ] a. Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)

[ ] b. Video-sharing websites (YouTube, etc.)

[ ] c. Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)

[ ] d. Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)

[ ] e. Textbook publisher resource websites (Pearson, PrenticeHall, McGraw-Hill, etc.)

[ ] f. Micro-blogs (Twitter, etc.)

[ ] g. Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)

[ ] h. Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)

[ ] i. Wikis (Wikipedia, course wiki, etc.)

[ ] j. Blogs

[ ] k. Online virtual worlds (Second Life, Forterra, etc.)

15. How many of your instructors:

	Almost none	Some	About half	Most	Almost all	Don't know
a. Use information technology (IT) effectively in courses						
b. Provide students with adequate training for the IT the instructor uses in his or her course						
c. Have adequate IT skills for carrying out course instruction						

16. How often do you use course or learning management systems (a system that provides tools such as online syllabi, sample exams, and gradebook)? Examples include WebCT, Blackboard, Desire2Learn, Sakai, Moodle, or an institution-specific system. *Required.*

[ ] Never. *Go to 20.*

[ ] Once per year. *Go to 17, 18, 19, 20.*

[ ] Once per quarter/semester. *Go to 17, 18, 19, 20.*

[ ] Monthly. *Go to 17, 18, 19, 20.*

[ ] Weekly. *Go to 17, 18, 19, 20.*

[ ] Several times per week. *Go to 17, 18, 19, 20.*

[ ] Daily. *Go to 17, 18, 19, 20.*

17. Are you using a course or learning management system for any of your courses this quarter/semester?

[ ] No

[ ] Yes

18. What is your skill level using course or learning management systems?

[ ] Not at all skilled

[ ] Not very skilled

[ ] Fairly skilled

[ ] Very skilled

[ ] Expert

19. Describe your overall experience using course or learning management systems.

[ ] Very negative

[ ] Negative

[ ] Neutral

[ ] Positive

[ ] Very positive

20. How many of your courses this quarter/semester are entirely online?

[ ] None

[ ] Some

[ ] All

21. What is your opinion about the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I get more actively involved in courses that use information technology (IT).					
b. The use of IT in my courses improves my learning.					
c. IT makes doing my course activities more convenient.					
d. By the time I graduate, the IT I have used in my courses will have adequately prepared me for the workplace.					
e. My institution's IT services are always available when I need them for my coursework.					
f. I skip classes when materials from course lectures are available online.					
g. When I entered college, I was adequately prepared to use IT as needed in my courses.					

22. Which of the following best describes you?

[ ] I am skeptical of new technologies and use them only when I have to.

[ ] I am usually one of the last people I know to use new technologies.

[ ] I usually use new technologies when most people I know do.

[ ] I like new technologies and use them before most people I know.

[ ] I love new technologies and am among the first to experiment with and use them.

23. I like to learn through:

	No	Yes	Don't know
a. Text-based conversations over e-mail, instant messaging, and text messaging			
b. Programs I can control, such as video games, simulations, etc.			
c. Contributing to websites, blogs, wikis, etc.			
d. Running Internet searches			
e. Listening to audio or watching video content			
f. Creating audio or video content			

24. How often do you use social networking websites for school, work, or recreation (Facebook, MySpace, Bebo, LinkedIn, etc.)? *Required.*

[ ] Never (do not use any social networking websites). *Go to 29.*

[ ] Once per year. *Go to 25, 26, 27, 28, 29.*

[ ] Once per quarter/semester. *Go to 25, 26, 27, 28, 29.*

[ ] Monthly. *Go to 25, 26, 27, 28, 29.*

[ ] Weekly. *Go to 25, 26, 27, 28, 29.*

[ ] Several times per week. *Go to 25, 26, 27, 28, 29.*

[ ] Daily. *Go to 25, 26, 27, 28, 29.*

25. Which of the following social networking websites do you use? *Check all that apply.*

[ ] a. Bebo
[ ] b. Facebook
[ ] c. LinkedIn
[ ] d. MySpace
[ ] e. Tagged
[ ] f. myYearbook
[ ] g. Classmates
[ ] h. Flickr
[ ] i. Other

26. How do you use social networking websites? *Check all that apply.*

[ ] a. Stay in touch with friends
[ ] b. Make new friends I have never met in person
[ ] c. Find out more about people (I may or may not have met)
[ ] d. As a forum to express my opinions and views
[ ] e. Share photos, music, videos, or other work
[ ] f. For professional activities (job networking, etc.)
[ ] g. Participate in special-interest groups
[ ] h. Plan or invite people to events
[ ] i. Play games
[ ] j. Follow/interact with my college's or university's social/extracurricular activities (athletics, clubs, arts, etc.)
[ ] k. Use my college's or university's administrative services or communicate with administrative offices (registration, advising, financial aid, billing, etc.)
[ ] l. Communicate with classmates about course-related topics
[ ] m. Communicate with instructors about course-related topics
[ ] n. Other

27. Do you limit or restrict who has access to your profiles on social networking sites?

[ ] I don't restrict access.
[ ] I put some restrictions on access.
[ ] I put a lot of restrictions on access.
[ ] Don't know.

28. Are any of your current or previous college or university instructors among the people you've accepted as friends or contacts on social networking sites?

[ ] No

[ ] Yes

[ ] Don't know

29. Would you like to see more use of social networking websites in your courses?

[ ] No

[ ] Yes

[ ] Don't know

30. What is your gender?

[ ] Male

[ ] Female

31. What is your cumulative grade point average (GPA)?

[ ] A

[ ] A-

[ ] B+

[ ] B

[ ] B-

[ ] C+

[ ] C

[ ] C- or lower

[ ] Don't know

32. What is your class standing?

[ ] Senior or final year

[ ] Freshman or first year

[ ] Other

33. Are you currently a full-time or part-time student? *Part-time is fewer than 12 credit hours per quarter/semester.*

[ ] Full-time

[ ] Part-time

34. Do you reside on campus or off campus?

[ ] On campus

[ ] Off campus

35. What are you majoring in? *Check all that apply.*

[ ] a. Social sciences

[ ] b. Humanities

[ ] c. Fine arts

[ ] d. Life/biological sciences, including agriculture and health sciences

[ ] e. Physical sciences, including math

[ ] f. Education, including physical education

[ ] g. Engineering

[ ] h. Business

[ ] i. Other

[ ] j. Undecided

36. Which institution are you attending? *Required. Dropdown list of institutions.*

Before proceeding, please confirm that the name of your institution is correct in the answer box.

37. Is there anything you would like to tell us about your experience with IT in or out of courses?_____

Thank you! You have reached the end of the survey. Visit the ECAR website to see our research and learn more about the EDUCAUSE Center for Applied Research. If you have any questions or concerns, please e-mail ecar@educause.edu.

Just one more step!

Click "Finish" to submit your survey.

Once you click "Finish," you will see confirmation that your survey has been submitted.

Appendix C

Qualitative Interview Questions

1. Background

a. Student information: age, gender, senior/freshman, full/part time, on/off campus, discipline.
b. How many computers do you own? What kinds? How long have you owned them?
c. Do you own a smartphone or PDA that can access the Internet? Do you use it to access the Internet? What other electronic devices do you own?
d. What do you use your smartphone or PDA for?
e. Have you used your smartphone or PDA for any university applications? Which ones? Instruction?

2. Skill and use

a. How skilled are you at using computer technology to do the work required for your classes?
b. Much is being said and written about the current generation of students using information technology extensively and being tech savvy. Do you think this statement is true of yourself? Of your friends?
c. What kinds of technology skills are you weak in? What are you strong in?
d. What kinds of technology skills do you think students in general are weak in?
e. Do you use computers and the Internet for entertainment? If so, what kinds of activities do you engage in for entertainment?
f. What impact do you think a student's major has on his or her use and skills with technology?
g. What sorts of things do you use on the Internet (blogs, wikis, YouTube, etc.)? How much do you use them?
h. Are you an active user of social networking sites (Facebook, MySpace, Bebo, etc.)? Why or why not?
i. Why do you use the websites? How do you use them?

3. Your use of technology in courses

a. How have instructors used information technology in the courses you have taken thus far?
b. How effective are your instructors with these information technologies?
c. What kinds of website technologies are you using in your courses? Social networking sites? Collaboration tools with other students (Google Docs, etc.)? How effective are they for you?
d. What are the major advantages that you see in the use of information technology in your courses?
e. What is the major disadvantage that you see in the use of information technology in your courses?
f. Do you think that the use of information technology in your courses has helped you in your learning?

   If so, how?

   If not, why not?

g. One of the findings of last year's study was that students indicated that technology in their classes was primarily about convenience. While improved learning was also mentioned, it seemed to play a lesser role. Can you please comment on this?
h. If there was one thing your professors could do or not do with respect to technology in your course, what would it be?
i. Have you taken any fully online courses (no classroom component)? Tell me about your experience with these courses.

4. Future

a. What advice would you give university administrators who are keen to encourage the effective use of technology in college courses? What sorts of things should they be doing?

5. Other Comments?

a. What social networking sites do you use?
b. How do you use them?
c. Are you using them in your courses? How?

Appendix D

Participating Institutions and Survey Response Rates

Four-Year Institutions

Institution	Freshman and Senior Enrollment*	Freshman and Senior Sample*	Sample Percentage of Enrollment	Number of Student Respondents	Response Rate
Arizona State University	25,989	6,497	25.0%	500	7.7%
Auburn University	9,864	2,500	25.3%	273	10.9%
Ball State University	7,372	3,480	47.2%	286	8.2%
Brandeis University	2,035	2,035	100.0%	635	31.2%
Bridgewater State College	4,082	1,020	25.0%	94	9.2%
Bryant & Stratton College–Cleveland, OH	–	–	–	39	–
Bucknell University	1,752	1,752	100.0%	290	16.6%
Butler University	2,129	1,000	47.0%	215	21.5%
California Lutheran University	1,174	1,174	100.0%	226	19.3%
California State University, Fullerton	13,902	3,715	26.7%	411	11.1%
California State University, Northridge	14,516	4,913	33.8%	903	18.4%
California State University, Sacramento	–	–	–	403	–
Case Western Reserve University	–	–	–	349	–
Catawba College	660	660	100.0%	67	10.2%
Central Michigan University	10,581	10,581	100.0%	978	9.2%
Clark University	1,062	1,062	100.0%	267	25.1%
Clemson University	8,053	1,042	12.9%	149	14.3%
The College of New Jersey	3,010	1,000	33.2%	66	6.6%
College of Saint Benedict/Saint John's University	2,130	2,130	100.0%	253	11.9%
Colorado College	1,147	344	30.0%	71	20.6%
Connecticut College	954	318	33.3%	87	27.4%
Coppin State University	1,303	1,303	100.0%	48	3.7%
Drew University	893	893	100.0%	122	13.7%
Drexel University	7,243	1,855	25.6%	244	13.2%
Eastern Michigan University	9,210	2,290	24.9%	243	10.6%
Embry-Riddle Aeronautical–Prescott Campus	906	906	100.0%	99	10.9%

Embry-Riddle Aeronautical University	2,796	2,796	100.0%	304	10.9%
Embry-Riddle Aeronautical University–Worldwide	4,274	2,094	49.0%	202	9.6%
Emory University	3,594	1,940	54.0%	175	9.0%
Franklin W. Olin College of Engineering	–	–	–	65	–
Furman University	1,300	1,300	100.0%	245	18.8%
Georgia Gwinnett College	1,610	1,017	63.2%	202	19.9%
Georgia Southern University	13,443	4,300	32.0%	370	8.6%
Georgia State University	–	–	–	227	–
Hamilton College	985	247	25.1%	55	22.3%
Harrisburg University of Science and Technology	101	101	100.0%	24	23.8%
Indiana State University	5,304	1,800	33.9%	279	15.5%
Indiana University	16,513	700	4.2%	75	10.7%
Indiana University-Purdue University Indianapolis	11,839	700	5.9%	85	12.1%
Keene State College	2,575	2,575	100.0%	370	14.4%
Louisiana State University	11,082	2,771	25.0%	153	5.5%
Macalester College	1,015	400	39.4%	137	34.3%
Messiah College	1,391	1,391	100.0%	370	26.6%
Michigan State University	–	–	–	436	–
Middle Tennessee State University	12,798	3,000	23.4%	269	9.0%
North Greenville University	1,162	719	61.9%	107	14.9%
Northwestern University	–	–	–	116	–
Oakland University	6,515	6,515	100.0%	942	14.5%
Oberlin College	1,293	1,293	100.0%	412	31.9%
The Ohio State University	21,880	5,000	22.9%	655	13.1%
The Ohio State University at Lima Campus	790	790	100.0%	84	10.6%
The Ohio State University Mansfield	798	798	100.0%	86	10.8%
The Pennsylvania State University	34,377	8,000	23.3%	888	11.1%
Pepperdine University	1,722	1,722	100.0%	323	18.8%
Portland State University	9,500	4,700	49.5%	221	4.7%
Saint Leo University	–	–	–	621	–
Seton Hall University	2,622	1,200	45.8%	209	17.4%
Skidmore College	1,249	700	56.0%	119	17.0%
South Dakota State University	3,927	981	25.0%	130	13.3%
Stevens Institute of Technology	1,175	776	66.0%	192	24.7%
Towson University	–	–	–	400	–
Tufts University	–	–	–	460	–
The University of Arizona	16,476	1,020	6.2%	358	35.1%
University of Arkansas	8,966	2,040	22.8%	168	8.2%
University of Baltimore	1,295	1,295	100.0%	125	9.7%
University of Delaware	8,872	5,000	56.4%	510	10.2%
University of La Verne	–	345	–	53	15.4%
University of Maryland	12,115	4,000	33.0%	362	9.1%

University of Maryland, Baltimore County	4,800	1,200	25.0%	115	9.6%
The University of Memphis	8,578	8,578	100.0%	644	7.5%
University of Michigan–Ann Arbor	13,739	3,434	25.0%	304	8.9%
University of Missouri	–	–	–	240	–
University of Nevada, Las Vegas	18,692	11,928	63.8%	1,323	11.1%
University of New Hampshire	6,273	2,000	31.9%	288	14.4%
University of New Mexico	12,749	3,080	24.2%	435	14.1%
University of North Carolina at Pembroke	2,920	1,198	41.0%	106	8.8%
University of North Carolina Charlotte	8,553	8,553	100.0%	829	9.7%
University of North Dakota	5,769	1,350	23.4%	192	14.2%
University of Oregon	9,259	9,259	100.0%	1,699	18.3%
University of Scranton	2,324	786	33.8%	174	22.1%
The University of South Dakota	3,051	1,526	50.0%	339	22.2%
University of St. Thomas	3,015	1,100	36.5%	293	26.6%
University of Texas at San Antonio	–	–	–	107	–
University of Tulsa	1,503	877	58.3%	105	12.0%
University of Washington	13,498	2,000	14.8%	324	16.2%
University of West Georgia	4,759	1,665	35.0%	80	4.8%
University of Wisconsin–Eau Claire	5,819	1,600	27.5%	262	16.4%
University of Wisconsin–La Crosse	4,376	4,340	99.2%	1,128	26.0%
University of Wisconsin–Madison	15,147	2,000	13.2%	292	14.6%
University of Wisconsin–Milwaukee	11,401	11,401	100.0%	1,241	10.9%
University of Wisconsin–Oshkosh	5,447	1,365	25.1%	65	4.8%
University of Wisconsin–Parkside	2,560	2,560	100.0%	108	4.2%
University of Wisconsin–Superior	1,904	1,904	100.0%	430	22.6%
University of Wisconsin–Whitewater	4,519	2,500	55.3%	367	14.7%
Virginia Tech	11,457	11,457	100.0%	219	1.9%
Washington University in St. Louis	3,405	860	25.3%	164	19.1%
Wayne State University	9,713	9,713	100.0%	781	8.0%
Webster University	2,725	2,725	100.0%	269	9.9%
Western Carolina University	4,110	4,110	100.0%	359	8.7%
Williams College	1,077	1,077	100.0%	207	19.2%

Two-Year Institutions

Institution	Total Enrollment*	Sample*	Sample Percentage of Enrollment	Number of Student Respondents	Response Rate
Brazosport College	–	–	–	39	–
Bryant & Stratton College–Albany, NY	–	–	–	50	–
Bryant & Stratton College–Amherst, NY	–	–	–	45	–
Bryant & Stratton College–Buffalo, NY	–	–	–	105	–
Bryant & Stratton College–Eastlake, OH	–	–	–	61	–
Bryant & Stratton College–Greece Campus, Rochester, NY	–	–	–	20	–

Bryant & Stratton College–Henrietta Campus, Rochester, NY	–	–	–	41	–
Bryant & Stratton College–Milwaukee, WI	–	–	–	131	–
Bryant & Stratton College–Parma, OH	–	–	–	49	–
Bryant & Stratton College–Richmond, VA	–	–	–	59	–
Bryant & Stratton College–Southtowns Campus, Orchard Park, NY	–	–	–	134	–
Bryant & Stratton College–Syracuse North Campus, Liverpool, NY	–	–	–	42	–
Bryant & Stratton College–Syracuse, NY	–	–	–	39	–
Bryant & Stratton College–Virginia Beach, VA	–	–	–	36	–
Bucks County Community College	2,668	2,668	100.0%	119	4.5%
Chandler Gilbert Community College	9,847	7,121	72.3%	116	1.6%
Estrella Mountain Community College	6,704	1,676	25.0%	108	6.4%
Glendale Community College	–	–	–	86	–
Grand Rapids Community College	–	2,000	–	414	20.7%
Madison Area Technical College	21,500	16,167	75.2%	1,094	6.8%
Mesa Community College	18,530	1,900	10.3%	130	6.8%
Passaic County Community College	8,700	8,700	100.0%	565	6.5%
Phoenix College	–	–	–	12	–
Red River College	5,311	2,685	50.6%	297	11.1%
Rio Salado College	–	–	–	209	–
Scottsdale Community College	10,868	2,500	23.0%	147	5.9%
Wisconsin Indianhead Technical College	4,175	4,175	100.0%	411	9.8%

** Enrollment and sample information are displayed only for those institutions that provided this data to ECAR.*

Appendix E

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