

## Key Findings

# ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control

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Today's typical undergraduate student is often characterized as preferring teamwork, experiential activities, and the use of technology. Marc Prensky calls them "digital natives," referring to the fact that they have grown up with technology, compared to "digital immigrants," who did not.<sup>1</sup> Prensky's digital immigrants include previous generations of students and many of today's faculty and administrators. Ninety-five percent of the students in the *ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control* are members of this "millennial" generation.

The study used survey and interview data to create a portrait of today's students' experiences with and skill using information technology. Four issues are addressed: what kinds of information technologies do students use; with what levels of skill do they use these technologies; how does this use contribute to their undergraduate experience; and what value does the use of information technology add in terms of learning gains. Additionally, this study identifies some effective practices in the support of student use of technology and speculates on the future of student IT use and skills in higher education.

## Methodology and Study Participants

The study consisted of four data collection and analytical initiatives:

- A literature review to identify and clarify the study's major elements and create a working set of hypotheses to be tested. Included in this review were other higher education IT student surveys.
- A review and comparison with the 2003 ECAR study, *Faculty Use of Course Management Systems*, undertaken at the University of Wisconsin System under the direction of Dr. Glenda Morgan.

- A quantitative survey among a sample of 9,350 freshmen and 9,050 senior students with 4,374 respondents at 13 higher education institutions: Colgate University; Drexel University; University of California, San Diego; University of Minnesota, Crookston; University of Minnesota, Twin Cities; University of Wisconsin–Colleges; University of Wisconsin–Eau Claire; University of Wisconsin–La Crosse; University of Wisconsin–Madison; University of Wisconsin–Milwaukee; University of Wisconsin–Oshkosh; University of Wisconsin–Stout; and University of Wisconsin–Whitewater.
- Interviews of 132 students in focus group settings at six institutions and 23 administrators who support student information technology on their campuses.

The institutions chosen represent a mix of the different types of higher education institutions in North America, and the study achieved a 95 percent confidence rate with a +/-5 percent margin of error. Note, however, that while the findings are statistically significant for the institutions in the study and are likely indicative of student behavior at many similar institutions, they are not conclusive. Also, self-assessment of skills with technology is not a true measurement tool.

## Findings

Following are some of the important findings of the *ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control*.

### Technology Ownership

Fully 93.4 percent of the students who participated in the study own a computer. Desktop computers are owned by 70.7 percent of the senior respondents and 57.1 percent of the freshmen respondents. Laptop computers are owned by 38.5 percent of the senior respondents and 52.7 percent of the freshmen respondents. Personal digital assistants (PDAs) are owned by just 11.9 percent overall.

### Internet Access

Freshmen students, who often reside on campus, most often access the Internet through university resources (82.2 percent). Seniors most often use commercial access (56.4 percent). More than 81 percent of students have access to broadband service. In the qualitative interviews, students reported that their satisfaction with access is partially shaped by the institution's IT environment, and they are often frustrated with overcrowded computer labs.

### Patterns of Technology Use

Students were asked about the applications they use on their electronic devices. They reported that they use technology primarily for educational purposes, secondarily for communication, and lastly for presentation. They use computers for writing documents (99.5 percent) and sending e-mail (99.5 percent), followed by surfing the Internet for pleasure (97.2 percent) and for classroom activities (96.4 percent). They do many of these activities simultaneously.

## Hours of Technology Use

The quantitative survey asked students how many hours each week they used a computer and for what applications. Table 1 indicates that students primarily use information technology for academic applications, communications, and entertainment. Academic usage is strongly related to the student's academic major and class status (senior versus freshman).

**Table 1. Activities and Hours Spent per Week**

Activities	N	Mean*	Std. Deviation
Classroom activities and studying using an electronic device	4,367	4.01	1.241
Writing documents (word processing)	4,352	3.76	0.955
Surfing the Internet for pleasure	4,359	3.47	1.213
Creating, reading, sending e-mail	4,359	3.47	0.979
Chatting with friends or acquaintances using instant messaging	4,347	3.45	1.620
Using an electronic device (computer, Palm device, etc.) at your place of employment	3,337	3.31	2.306
Downloading or listening to music or videos/DVDs	4,336	3.15	1.563
Completing a learning activity or accessing information for a course using course management systems	4,344	2.48	1.152
Using a university library resource to complete a class assignment	4,349	2.46	1.010
Playing computer games	4,337	2.39	1.312
Creating spreadsheets or charts (Excel, etc.)	4,342	2.07	1.060
Online shopping	4,353	2.06	0.960
Creating presentations (PowerPoint, etc.)	4,342	1.82	0.896
Creating graphics (Photoshop, Flash, etc.)	4,335	1.79	1.077
Creating Web pages (Dreamweaver, FrontPage, etc.)	4,315	1.39	0.898
Creating and editing video/audio (Director, iMovie, etc.)	4,338	1.34	0.793

\*Scale = 1 (do not use), 2 (less than an hour), 3 (1–2 hours), 4 (3–5 hours), 5 (6–10 hours), 6 (11 or more hours)

## Level of Skill

When asked about the level of skill they felt they had attained with respect to each application, students rated themselves highly skilled in the use of communications, word processing, and the Internet. Table 2 shows that the means for e-mail, instant messenger, word processing, and Web surfing were all greater than 3.0.

**Table 2. Skill Levels Attained**

Application	Mean*	Std. Deviation
E-mail	3.60	0.525
Instant messenger	3.54	0.652
Word processing	3.53	0.553
Web surfing	3.47	0.578
Presentation software (PowerPoint, etc.)	2.90	0.762
Online library resources	2.88	0.687
Spreadsheets (Excel, etc.)	2.86	0.763
Course management systems	2.83	0.744
Graphics (Photoshop, Flash, etc.)	2.45	0.846
Creating Web pages (Dreamweaver, FrontPage, etc.)	2.17	0.910
Creating and editing video/audio (Director, iMovie, etc.)	2.07	0.848

\*Scale = 1 (very unskilled) to 4 (very skilled)

Seniors tended to rank themselves higher than freshmen with tools such as PowerPoint and spreadsheets. A student's major was a significant factor, with the highest skills reported by business, engineering, and life sciences students. While the quantitative data indicate that students say they have the skills they need, in the qualitative interviews, student skills seemed more problematic. These interviews indicate that students are skilled with basic office suite applications but tend to know just enough technology to accomplish their work. They do not have in-depth application knowledge or problem-solving skills.

### Information Technology in the Classroom

Students noted their preference for use of technology in the classroom, with the highest number of students (41.2 percent) preferring to take classes that use a moderate amount of technology. Approximately 23 percent preferred classes that use limited technology, and 30.8 percent preferred classes that use technology extensively. A student's previous positive experiences in the classroom had a major impact on the preference for classroom technology.

A student's major was also an important predictor of preferences for technology in the classroom, with engineering students having the highest preference for technology in the classroom (67.8 percent) followed by business students (64.3 percent). When analyzing students' preferences for classes using technology, a student's grade point average (GPA) was not a significant factor. Students with lower GPAs preferred classes using technology equally with those students with higher GPAs.

## Impact of Technology in the Classroom

Students were asked about the impact of technology on various classroom activities. The activity receiving the highest impact was “helped me to better communicate with the instructor,” with a mean of 3.85 (see Table 3).

**Table 3. Perceived Impact of Classroom Technology, by Activity**

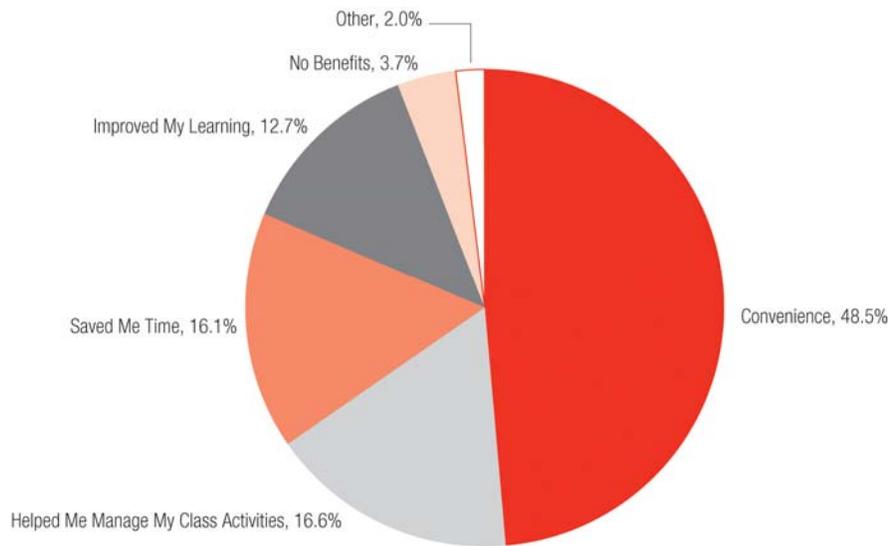
Activity	N	Mean*	Std. Deviation
The use of IT in classes has helped me to better communicate with the instructor.	4,358	3.85	0.845
The use of IT in courses has resulted in prompt feedback from the instructor.	4,351	3.84	0.813
The use of IT in courses has helped me communicate and collaborate with my classmates.	4,343	3.64	0.893
I primarily use IT in courses to improve the presentation of my work.	4,353	3.61	0.872
The use of IT in courses provides more opportunities for practice and reinforcement.	4,345	3.58	0.803
The use of technology in my classes met my expectations.	4,358	3.54	0.747
Classes that use IT allow me to take greater control of my class activities.	4,346	3.45	0.923
The use of IT in classes has helped me better understand complex or abstract concepts.	4,358	3.38	0.854
The instructors' use of technology in my classes has increased my interest in the subject matter.	4,347	3.25	0.906
Classes that use IT are more likely to focus on real-world tasks and examples.	4,347	3.23	0.884
I spend more time engaged in course activities in those courses that require me to use technology.	4,362	3.22	0.928
I get better grades in courses that use IT.	4,356	3.19	0.925
Faculty members need to give us more in-class training for IT used in the class.	4,361	3.04	0.976

\*Scale = 1 (strongly disagree) to 5 (strongly agree)

## Benefits of the Use of Technology in the Classroom

Figure 1 illustrates the benefits students perceived from the use of information technology in the classroom. Students cited convenience (48.5 percent) as the greatest benefit. When combined with saving time, the percentage increases to 64.6 percent. Only 12.7 percent said the most valuable benefit was improved learning. In the survey's open-ended comments, 134 students voluntarily identified convenience as one of the primary benefits of using information technology in classes. Even though students strongly emphasized the convenience factor of information technology use in the classroom, they also consistently stated that good use of technology helps them learn.

**Figure 1. Student Perceptions of Benefits of Classroom IT Use**



## Barriers to the Use of Information Technology in the Classroom

Students reported barriers to the use of information technology in the classroom. Overall, 54.3 percent of the students reported some barriers. Of those listed in the survey, the most problematic was “feels like extra work” (16.7 percent), followed by “the applications don’t run on my computer” (14.1 percent), “lack of access to printers” (13.4 percent), and “lack of technical support” (9.7 percent). These findings were reinforced by the number of times they were mentioned in an open-ended question on the survey.

## Course Management Systems

When students comment on technology in the classroom, they are most likely referring to the use of a course management system (CMS). Eighty-three percent of the students in the survey had taken a class that used a CMS. Seniors (90.1 percent) were more likely than freshmen (78.5 percent) to have taken a class that used a CMS.

Students who had taken a course using a CMS were asked to describe their overall experience: 76.1 percent were positive or very positive; 17.3 percent were neutral; and only 6.6 percent were negative or very negative. Ironically, students who had a stronger preference for technology in the classroom had a lower preference for the use of a CMS. With one exception, the higher the percentage of students who had used a CMS at each institution, the higher the positive assessment of the CMS at that institution.

## Course Management System Features Used

Course management systems offer a number of features in support of learning and course administration. Ninety-five percent of the students reported use of a syllabus feature. Reports of use

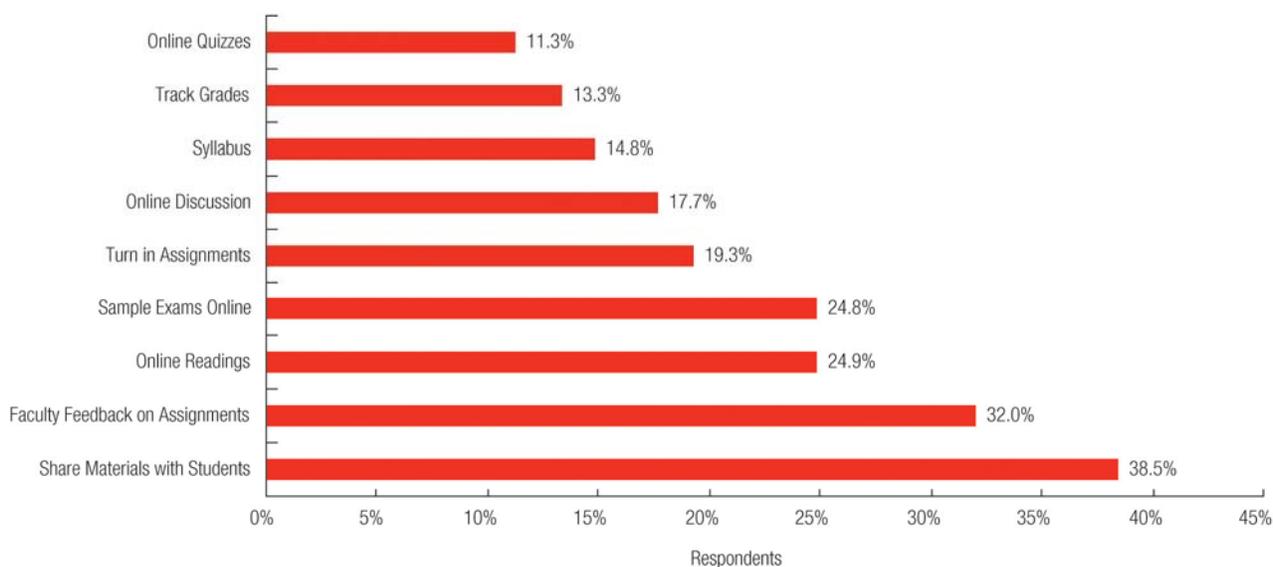
of the other features included online reading (94.8 percent), tracking grades (89.4 percent), sample exams online (88.8 percent), turning in assignments (78.5 percent), online discussion (74.2 percent), sharing materials with students (73.4 percent), obtaining faculty feedback (71.8 percent), and online quizzes (70.0 percent).

## Students' Perceived Benefits Using a CMS

Students were asked whether they perceived that a particular tool within a CMS improved learning, class management, or both. Students were also given the option of reporting that a tool had no effect on either learning or class management or that it had a negative effect. Classroom management scored highest, followed by improved learning. Negative perceptions were minimal.

Figure 2 shows that the interactive features used least by faculty were the features that students said contributed the most to their learning. Administrative and convenience features were rated most highly by students. When combining the percentage of students who said that the CMS improved learning and improved both learning and class management, "sharing materials with students" was ranked highest in improving learning (52.8 percent). In the qualitative interviews, students indicated a need for a more consistent approach to CMS use. Also, students and faculty commented on the need for training.

**Figure 2. CMS Features that Students Perceive Improve Their Learning**



## Future Trends

Given the current state of student use and skills with information technology and the limited use of all course management systems' features, higher education institutions need to evaluate their student information technology services. Students and faculty members alike need good technology education and training. Today's information technology use in instruction is primarily for convenience

and not for the higher goal of improving learning. Just as the first wave of enterprise resource planning (ERP) products primarily resulted in convenience and improved transaction benefits, this first wave of instructional technology products provides similar benefits. In the effort to truly revolutionize students' use of and skill with information technology—and to embrace instructional use of information technology—six trends are likely to lead the way:

1. Mining and analysis of student course activity data, leading to programs and effective practices.
2. Increased student and faculty information literacy, including the emergence of academic standards of research and evidence in Web-dominated information environments.
3. Ongoing improvement in the quality and usability of course delivery systems.
4. Continued proliferation of networked scholarly information.
5. Exploration and integration of new capabilities and practices as they emerge from the arenas of video gaming, virtual reality, simulation, and modeling.
6. Greater emphasis by institutions on planning and creating comprehensive and integrated work plans for the implementation of technology in support of learning.

## Conclusion

While this study of student information technology use and skills is just a snapshot in time, the findings can help guide higher education institutions in planning and improving information technology services. Currently, the student experience with technology is predominantly about convenience, communication, and management of classroom activities. Current students, while more skilled than previous generations of students, have good office skills but still need more training to understand tools in-depth and increase their problem-solving skills. The results of this study can be used, along with institutional data, to create instructional information technology plans to improve technology services in support of learning.

## Endnote

1. M. Prensky, "Digital Natives, Digital Immigrants," *On the Horizon*, Vol. 9, No. 5, 2001.

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*A copy of the full study referenced above will be available via subscription or purchase through the EDUCAUSE Center for Applied Research ([www.educause.edu/ecar/](http://www.educause.edu/ecar/)).*

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