EDUCATIONAL TECHNOLOGY AT THE UNIVERSITY OF WASHINGTON

REPORT ON THE 2005 INSTRUCTOR AND STUDENT SURVEYS

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EXECUTIVE SUMMARY

OVERVIEW

As the role of educational technology continues to become more and more central, it is important to understand when, how, and why technology becomes a key feature in the educational landscape. To gain this perspective, six campus units joined forces: the Office of Learning Technologies, Computing & Communications, UW Libraries, Educational Outreach, the Student Technology Fee Committee, and the Office of Undergraduate Education. Headed by the Office of Learning Technologies, this collaborative team developed and distributed instructor and student surveys, building on work begun during a previous iteration of this study conducted in 2001 and 2002.

In the two surveys, instructor and student, we asked a series of questions about respondents' experiences with and perspectives on academic technologies. A large number of the questions were the same across the instructor and student surveys, allowing for a comparison of the two groups; a smaller number of questions carried over from the 2001 and 2002 surveys, allowing for a longitudinal comparison. We divided graduate students across the two instruments: those that held teaching assistantships completed the instructor survey and those that did not teach completed the student survey. In spring 2005, we sent the instructor survey to 4,390 individuals that had taught courses in spring 2004, autumn 2004, or winter 2005. At the same time, we sent the student survey to a random sampling of 3,500 students. The response rate was 34.4% for instructors and 28.2% for students.

We also conducted focus groups in late spring, with 40 instructors and 25 students participating in this portion of the study. We asked focus group attendees to describe their current use of educational technologies, the supports and barriers to that use, and their goals for the future. The focus groups allowed the research team to gain detailed knowledge about participants' experiences with and perspectives on educational technology.

In this report, we present key findings that emerged from our analysis of this data. The focus of our analysis was a comparison of expertise with technology, use of technology, and beliefs about technology across different campus populations. We list our primary conclusions and provide recommendations based on those conclusions below. The order of these lists follows the chronology of our discussion in the report.

CONCLUSIONS

- Differences in gender and age influence technological expertise ratings and technology use patterns; most significantly, men rate their expertise with and use of technology higher than women do.
- Faculty members use a higher number of established technologies for academic purposes than undergraduates do; undergraduates use a higher number of emerging technologies for academic purposes than faculty do.
- Support for general-access technology facilities and services is high among both instructors and students.
- Undergraduate students want more course materials available online.
- Faculty members want more opportunities to use technology to support their instruction. In particular, they want better access to technology in classrooms.
- The addition of wireless access in classrooms is likely to have a substantial impact on how many instructors and students bring laptop computers to class.
- Interest in Web-based tools, such as electronic portfolios and online discussion boards, is high.
- Teaching assistants and graduate students that do not teach not only differ from each other in their experiences with and perspectives on educational technology, but they also differ from faculty members and undergraduate students—making the division of graduate students across the two survey instruments problematic.
- Teaching assistants exhibit less interest in academic technologies than faculty members, undergraduate students, or other graduate students do.

RECOMMENDATIONS

- Further investigate how gender and age influence technology use and expertise.
- Work with undergraduate students to identify ways that emerging technologies can be used for academic purposes.
- Continue to support general-access technology facilities and services.
- Identify and remove obstacles to putting course materials and other resources online.
- Commit to improving technology in classrooms.
- Engage in campus discussions about wireless in classrooms, including models of effective use.
- Provide more opportunities for students and instructors to learn about and use Web-based tools.
- Revise the design of future studies to include a separate survey for graduate students, rather than dividing them between the instructor and student surveys.
- Provide more opportunities for teaching assistants to use technology to support their instruction.

In the complete report we provide a detailed explanation of the conclusions and recommendations outlined above. As you read through its pages, you will gain awareness of the multifaceted role that technology plays in the academic lives of instructors and students at the University of Washington. The report also exposes several areas where current technological resources do not keep pace with the goals and ambitions expressed by instructors and students. In addition to increasing our knowledge of current technology use and technological needs across the University, the study data point towards the future—providing information that will allow the collaborating partners and the University as a whole to make informed decisions about the future of educational technology at the University of Washington.

METHODS

OVERVIEW

In this section, we provide details about the logistics of this research endeavor. We list the partners whose collaborative efforts made this study possible and provide a brief history of research on this topic at the University of Washington. The bulk of this section details the process we used to conduct this study.

PARTNERS

The 2005 Educational Technology Survey Committee included key individuals from the following collaborating units: the Office of Learning Technologies (OLT), Computing & Communications (C&C), the Office of Undergraduate Education (OUE), UW Libraries, UW Educational Outreach (UWEO), and the Student Technology Fee Committee (STFC). The partnering unit were brought together by their interest in and work with educational technologies. The Office of Educational Assessment (OEA), within the Office of Undergraduate Education, provided expertise in large-scale survey design and implementation. The Faculty Council on Educational Technologies (FCET) endorsed the surveys prior to distribution.

HISTORY

Over the past fifteen years, various campus units have conducted student surveys focusing on educational technologies. Prior to 2002, these surveys represented a series of disconnected efforts. In a single year, any given student could participate in multiple surveys containing questions regarding technology. While the multiple surveys often asked similar questions, there were enough differences in the phrasing of the questions to make a comparison of data across surveys impossible. This process was frustrating to students and the results brought more questions than answers for the campus community. Faculty, on the other hand, were not directly surveyed regarding educational technologies. While an occasional University survey may have included a question or two on technology, prior to 2001 there had never been a focused effort to understand instructors' experiences with technology.

2001 Instructor Survey

In 2001, the Program for Educational Transformation Through Technology (PETTT), within the Office of Learning Technologies, conducted the first faculty survey on educational technologies. Results of the original report are available at:

http://www.washington.edu/oea/pdfs/reports/OEAReport0106.pdf

2002 Student Survey

In 2002, The Office of Learning Technologies brought together six partnering groups to coordinate their efforts in gathering students' opinions on educational technologies. Results of the 2002 coordinated survey are available at:

http://www.washington.edu/oea/pdfs/reports/OEAReport0304.pdf

PROCESS

Setting Goals

Universities are faced with the challenge of being aware of and responsive to continuous, and rapid, technological change. The goal of this study was to improve teaching and learning at the UW by

- contributing to a University-wide conversation about the uses of instructional technology,
- increasing student and faculty awareness of the ways in which technology can be used in the service of teaching and learning,
- facilitating informed decision-making regarding allocation of UW resources, and
- informing the design of tools and services that capitalize on successes, meet challenges, and ultimately best serve the University community's needs and desires.

Creating Instruments

Our study of educational technology has four components: an instructor survey, a student survey, instructor focus groups, and student focus groups. This mixture provides both quantitative and qualitative data from which we can draw conclusions about the expectations, perceptions, and uses of educational technology at the University of Washington.

In this current research effort, we developed survey instruments and focus group questions with the large-scale goals of our study in mind. Many of the survey questions we developed focused on an individual's self-assessment of technological expertise, patterns of technology use, and perceptions on educational technologies. Focus groups questions focused on an individual's experience with educational technologies and his or her opinions about their future uses.

In creating the survey instruments we also kept the following objectives in mind: consistency between instruments, clarity of language, and usefulness of questions. In terms of instrument consistency, we faced a difficult challenge. The 2001 faculty survey, created by PETTT, was radically different than the 2002 student survey, created by a collaborative team. We decided to use the 2002 student survey as a model for both the 2005 student survey and the 2005 instructor survey. As a result of this decision, we were able to collect very little longitudinal data on the instructor side. In our next iteration of this study, planned for 2008, we will be able to collect longitudinal data for both students and faculty. In order to pursue clarity of language, we introduced some changes between the 2002 student survey and the 2005 surveys at points where our previous data analysis indicated the phrasing of questions was unclear. We also chose to remove questions that did not yield useful data in the 2002 study.

In addition, we decided to add some questions to the 2005 surveys that were not asked in the 2002 student survey. In the 2001 instructor survey and the 2002 student survey, respondents wrote in comments regarding some technologies that had not been included in the survey. These same items were also mentioned (unprompted) in the focus groups. Therefore, we decided to include questions about instant messaging, wireless and mobile devices, blogging, video archives of instructional materials, and distance education in the 2005 surveys. We also decided to add questions that would allow us to see gaps between technologies and services currently available on campus and the University community's evolving needs and priorities. Overall, our decisions decreased our capacity for longitudinal analysis in order to increase the usefulness of the current surveys.

Selecting Samples

Working with the Office of Educational Assessment, we selected samples of students and instructors for the surveys. We selected a random sample of 3,500 students for the student survey, distributed across all three campuses. The students selected consisted of both undergraduates and graduate students. For the faculty survey we included all University employees that had taught on any of the three campuses in spring 2004, autumn 2004, and winter 2005. The instructor sample consisted of 4,390 individuals, including faculty, teaching assistants, lecturers, and staff.

Conducting Surveys

We conducted the surveys during spring quarter 2005. Each group was contacted multiple times during the quarter. The instructor survey was distributed via two email messages and two paper letters. The email messages pointed instructors to an online survey. The paper letters provided respondents the option of completing a paper survey (included with letter) and returning it to us, or completing the online survey. Notifications were distributed as follows:

DATE	DISTRIBUTION METHOD	AUTHOR
March 29	Email	G. Ross Heath (Faculty Senate)
April 12	Letter	David Thorud (Acting Provost)
April 26	Email	Nana Lowell (OEA)
May 11	Letter	Oren Sreebny (C&C)

The instructor response rate was 34.4% (1,422), after factoring out the instructors that directly declined to participate or that we could not contact. 57% of instructor respondents completed the survey online.

The student survey was distributed via four email messages and one paper letter. The email messages pointed students to an online survey. The paper letters provided respondents the option of completing a paper survey (included with letter) and returning it to us, or completing the online survey. Notifications were distributed as follows:

DATE	DISTRIBUTION METHOD	AUTHOR
April 18	Email	Josh Bis (STFC)
May 10	Letter	Elizabeth Feetham (Graduate School) and George Bridges (OUE)
May 12	Email	Debbie McGhee (OEA)
May 19	Email	Karalee Woody (OLT)
May 25	Email	Josh Bis (STFC)

The student response rate was 28.2% (987), after factoring out the students that directly declined to participate. 76% of student respondents completing the survey online.

Conducting Focus Groups

We conducted focus groups in June and July 2005, slightly overlapping in time with the survey. Survey respondents were given the opportunity to volunteer to participate in a focus group. Faculty volunteers were eager to schedule time and attend a session. We had 40 instructors participate in focus groups. Students who volunteered were difficult to connect with and very few attended the focus groups. Therefore, we sought a wider audience in the student pool. We advertised online in the *Catalyst Lab News* page and offered students a chance of winning a jump drive. Through these combined efforts we recruited 25 student participants.

Analyzing Data

Upon completion of the surveys, The Office of Educational Assessment compiled the data and provided a copy to the Office of Learning Technologies. The analysis of the quantitative data conducted by both groups allows us to provide two different views of the study data. The Office of Educational Assessment compiled basic statistics that summarize total responses to each survey on all questions. Their summative report of findings appears online at http://www.washington.edu/oea/pdfs/reports/OEAReport0601.pdf. The findings that we present in this report are the result of analysis efforts based in Catalyst Research and Development, within the Office of Learning Technologies. In our analysis, we examined portions of the quantitative data in depth, along with qualitative data gathered during focus groups and in the general comments section provided at the end of both surveys. Our analysis, presented here, focuses on a comparison of key trends across different University populations. The two reports coordinate with each other to provide a full picture of study findings.

Reporting Findings

This report is available online at: http://catalyst.washington.edu/projects/. Survey findings have, and will continue to be, presented at numerous conferences and for various groups on campus including those listed below.

Educause Annual Conference – Orlando FL, Oct 2005
SIGUCCS Annual Conference – Monterey CA, Nov 2005
UW ATAC meeting – Nov 2005
UW FCET meeting – Dec 2005
UW STFC meeting – Dec 2005
UW Computing Directors – Jan 2006

Scheduled upcoming meetings and conferences include:

Educause Western Regional Conference – San Francisco CA, Apr 2006
UW Spark Session – Apr 2006

RESULTS

OVERVIEW

In this section, we look in depth at portions of the study data in order to understand how technological expertise, technology use, and perspectives on technology vary among different university populations. This approach allows us to explore trends that impact key groups within the larger university community. The survey summaries presented by the Office of Educational Assessment complement our analysis, providing an overview of the complete data sets for the faculty and student surveys.

Some of the most interesting trends in the data involve differences between faculty members and undergraduate students. In the next few pages we provide a demographic comparison of these populations and a detailed account of their self-reported expertise and experience with various technologies. Building on this foundation, we present data from the surveys and focus groups regarding faculty and students' perspectives on educational technology, including desired long-term goals. We end our comparison of these groups by identifying the emerging technologies that are gaining support at the University of Washington.

Next, we expand our analysis to include graduate students. As described earlier, we divided the graduate population between the two surveys: those that had taught one or more classes during the 2004-5 academic year answered the faculty survey and those that had not taught answered the student survey. Not only do graduate students differ from faculty members and undergraduates on many matters involving educational technology, but they also demonstrate marked differences within their own ranks.

Focusing our analysis on faculty members/undergraduate students and teaching assistants/graduate students allows us to highlight the varied impacts that technology has on teaching and learning. It also enables us to better understand how technology simultaneously bridges and expands natural divisions on campus.

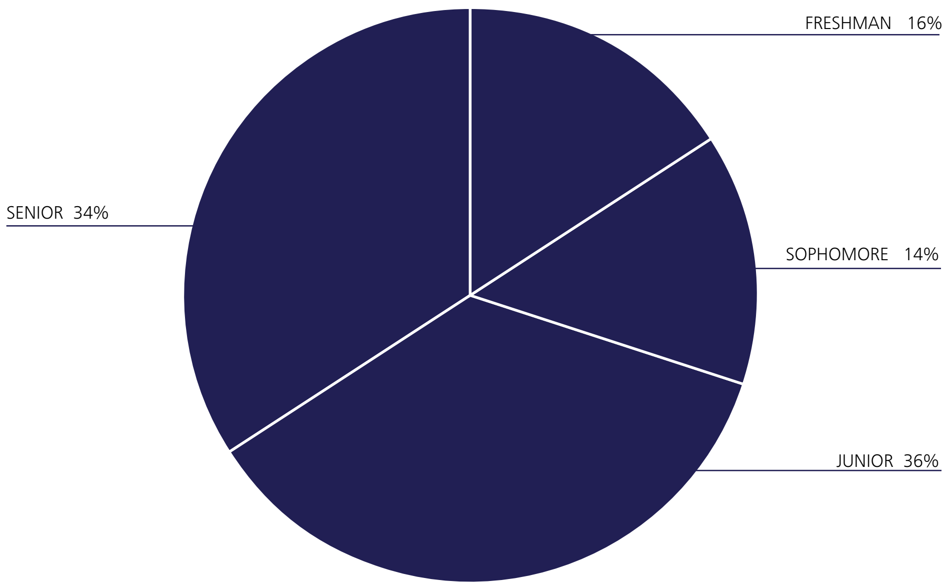
FACULTY AND UNDERGRADUATE COMPARISON

Demographics

We gathered similar demographic data on both the instructor and the student surveys. The information below provides a statistical comparison of two groups: undergraduate students and faculty members.

Undergraduate Students

CLASS STANDING: STUDENTS
FIGURE 1

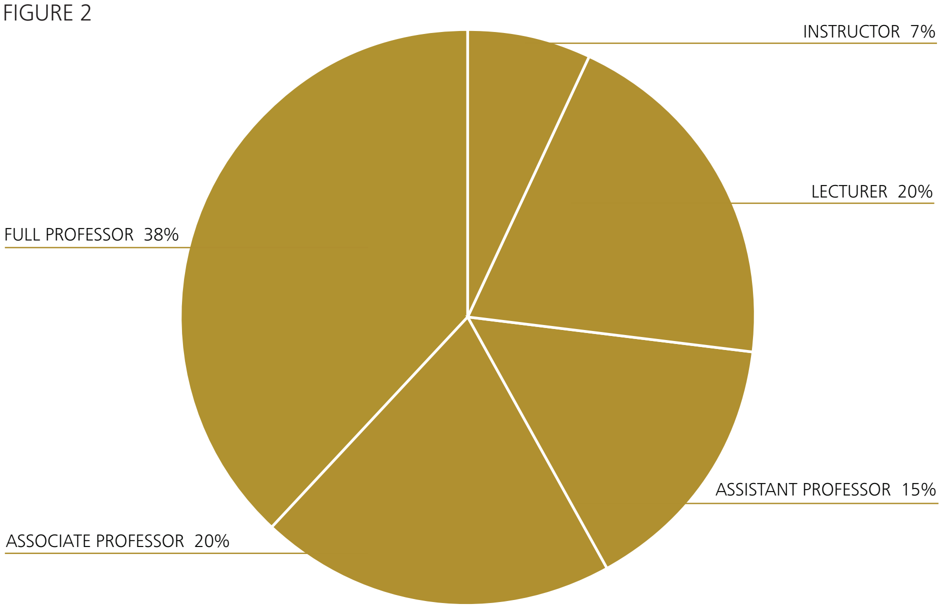


Undergraduate students accounted for 648 of the 978 respondents to the student survey. The average age of undergraduate student respondents was 22. The breakdown of undergraduate respondents by class standing is shown in FIGURE 1. This distribution is fairly representative, particularly in terms of the breakdown between lowerclassmen and upperclassmen. Compared with the number of students enrolled for spring quarter 2005, we were slightly overrepresented in juniors and underrepresented in seniors. The gender distribution of our respondents was not representative of campus. The percentage of male undergraduates completing the survey was 39%; the percentage of female undergraduates was 61%. Compared to enrolled students, where 52% were female and 48% were male, our respondent pool contains more women. We will discuss the significance of this difference later in this report.

Faculty

Faculty members comprised 884 of the 1422 respondents to the instructor survey. The average age of faculty completing the survey was 50. The breakdown of faculty respondents by rank is shown in FIGURE 2. When compared with faculty records (we used the HEPPS records for the 2004-5 academic year), the distribution across ranks show in FIGURE 2 is an accurate reflection of the University. The gender distribution of our respondents was also fairly representative of campus. The percentage of male faculty members completing the survey was 61%; the percentage of female faculty members was 39%. The distribution within our sample (based on information recorded in the HEPPS database) was 58% male, 35% female, and 7% undetermined. Differences in gender were evident between ranks. For example, 45% of male survey respondents identified themselves as full professors, compared with only 25% of female respondents.
While our analysis focuses on the

RANK FACULTY
FIGURE 2



differences between faculty members and undergraduates, at times patterns in the data were complicated by demographic differences within these populations. For instance, the comparison of faculty and undergraduates is distorted on some items, such as expertise ratings for computer skills, by gender differences. Since 61% of faculty respondents were male and 61% of undergraduates were female, gender had a strong influence on this population comparison. Therefore, in some areas of this report, we spend additional time discussing the impact of gender, and other demographic influences, on our findings.

Expertise

The surveys included two different questions about expertise. The first question asked participants to rate their general level of technological expertise. This question was the same across the 2005 student and instructor surveys, the 2001 instructor survey, and the 2002 student survey, allowing a unique opportunity for a longitudinal comparison of results. In addition, we asked respondents to the 2005 surveys to rate their expertise on a variety of specialized skills.

General Expertise

We posed the following question to both students and instructors: "How would you rate your current expertise as a computer user?" FIGURE 3 compares faculty and undergraduates' responses. The most striking aspect of this comparison is the similarity of responses between these two populations. Indeed, the sum the responses under the "advanced" and "expert" categories are identical for each group: 47% of respondents place themselves in these categories.

Trends in the qualitative data complicate this outcome. We gathered qualitative data from two sources: from open-ended questions at the end of the instructor and student surveys and during focus groups. In both forums, participants shared their perceptions of a technological divide between faculty members and undergraduates. Many faculty members commented on students' strong technological skills.

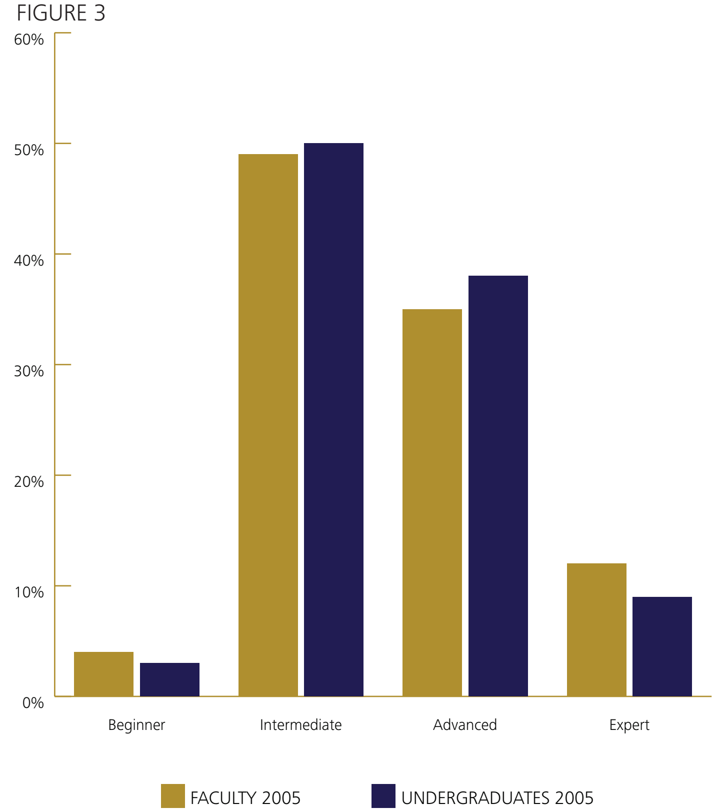
> *I never had students complain that the technology was beyond them or they were getting lost in technology or that they didn't understand technology. My feeling is that they are way ahead of us.*
>
> *Students are usually much more computer proficient and capable than I am.*

Students' observations of faculty were more mixed. Many observed that faculty members' expertise with technology varied widely across the University, both within and among disciplines. In general, students appreciated faculty that used technology well, but had little patience for poor execution.

> *Many instructors are unfamiliar with the technology that they try to use. These people shouldn't use it or should learn how.*
>
> *When they're on top of the technologies it definitely enhances learning. When they're not competent, then their use of technology detracts.*

The impressions voiced by instructors and students in the above quotes were not uncommon. Yet, when compared to the quantitative data on expertise, these perceptions do not appear valid, since faculty and undergraduates reported nearly identical levels of general knowledge about technology. In order to understand and resolve this tension, we present three elements that have bearing on our results. First, we compare our quantitative data with data gathered in the 2001 instructor and the 2002 student surveys. Second, we look at how faculty and undergraduates' answers compare on questions about specific types of technological skills. Finally, we explore the demographic differences that impact our data.

GENERAL EXPERTISE
FIGURE 3

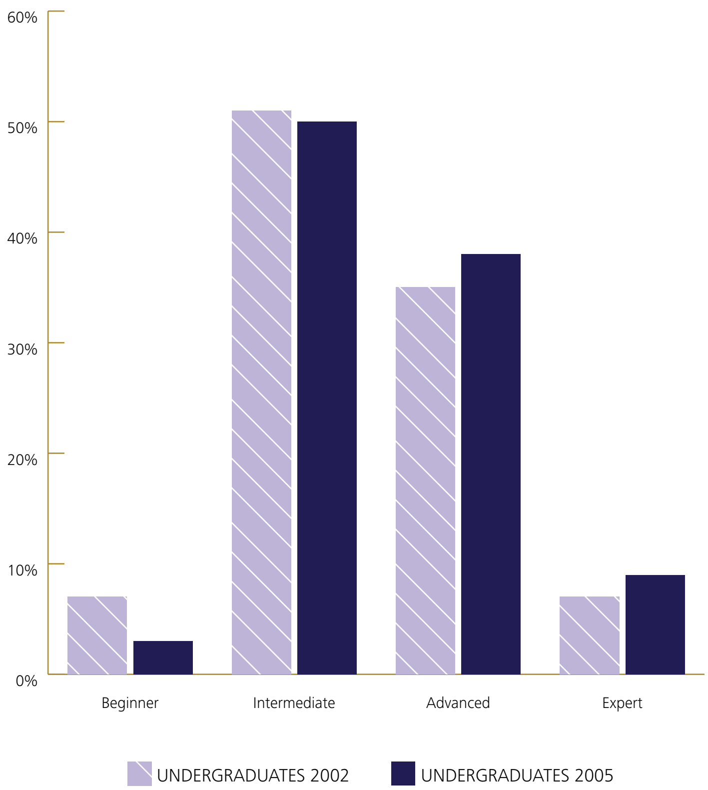


Longitudinal Comparison

A longitudinal analysis of survey data demonstrates that the similarities found in the 2005 data between faculty members and undergraduates are not unique; a similar pattern existed within the data from the 2001 and 2002 surveys (see FIGURES 4 and 5).

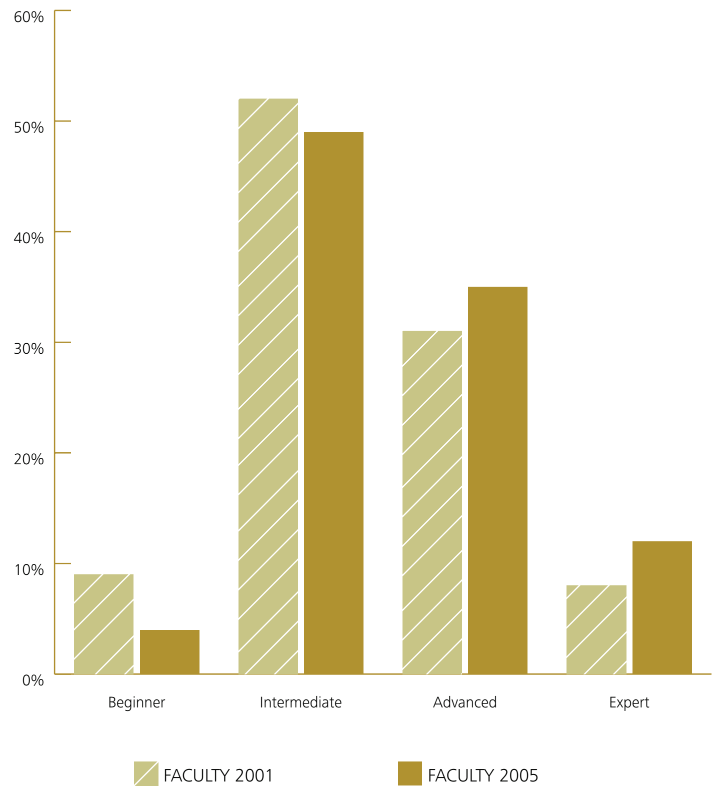
GENERAL EXPERTISE: UNDERGRADUATES

FIGURE 4



GENERAL EXPERTISE: FACULTY

FIGURE 5



Over the past few years, self-reported expertise has increased at a similar rate for both faculty members and undergraduates. FIGURE 4 shows a 5% increase in the number of undergraduates who rated themselves as advanced or expert in 2005, as compared to 2002. Similarly, FIGURE 5 shows an 8% increase in the number of faculty members who rated themselves as advanced or expert in 2005, as compared to 2001. The extra year of separation between the two instructor surveys likely accounts for the larger gain. Overall, the expertise numbers from 2005 show consistent patterns with the expertise patterns from 2001 and 2002. While undergraduates in 2002 do rate themselves slightly higher than faculty in 2001, 42% at advanced/expert for undergraduates compared to 39% for faculty, most of this difference can be accounted for by the time delay between the 2001 and 2002 surveys.

Categories of Expertise

In addition to the query about general expertise, we also posed questions to 2005 instructors and students about specific areas of expertise. Both groups were asked to rate their current level of expertise on thirteen skills, ranging from critically evaluating sources from the Internet to setting up a personal computer. We used a factor analysis to group results into sets of related skills, based on the similarity of responses. This process resulted in the identification of three categories of expertise: infrastructure, production, and resources.

The first category, infrastructure, involves high-level, complex skills, such as setting up a personal computer, using basic operating systems features, and creating a Web site. Web sites belong in this category because of the many steps required in their production—individuals not only need to understand Web-authoring software, but also to obtain and maintain an account space. Production skills involve using advanced features of a software program, such as using a word processor to create a document with text and illustrations or using a database system to set up and access information. The final category, resources, includes skills that involve using a computer to find information or to communicate with others; for example, the use of a computer to find scholarly information and resources.

CATEGORIES OF EXPERTISE
FIGURE 6

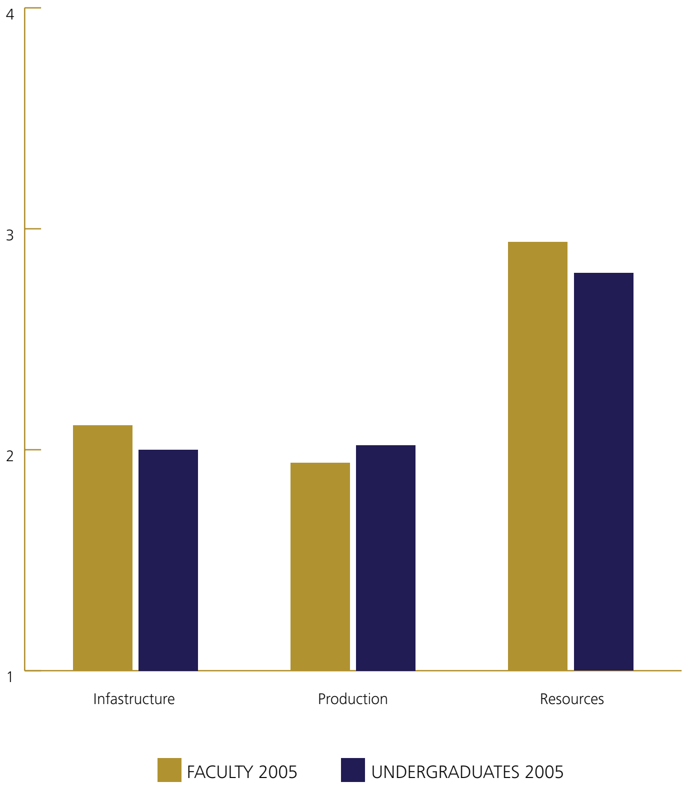


FIGURE 6 compares faculty and undergraduate responses across the three categories. The numbers represent the mean for each category. On the four-point scale a score of one equates to respondents averaging beginner-level expertise in a category and a score of four equates to respondents averaging expert-level expertise.

Unlike the question about general expertise, the three categories analyzed here reveal some discrepancies between faculty and undergraduates. Although the overall difference for infrastructure is statistically insignificant, with both groups averaging an intermediate-level expertise in this area, for a few individual items within this category there were significant differences between faculty and undergraduates. While neither faculty nor undergraduates measured highly on the ability to create a Web site, faculty did edge out students: 25% of faculty rated themselves as advanced or expert at this skill, as opposed to only 17% of undergraduates. The differences between these populations were more widespread within the other two categories. In general, undergraduates rated themselves higher for production and faculty rated themselves higher for resources.

When asked to rate their ability to use a word processor to create documents with text and illustrations, 67% of faculty rated themselves as advanced or expert, as compared to 71% of undergraduates. Based on qualitative data, some faculty would disagree with students' self-reported proficiency in these areas. A few faculty members noted that although most students had basic competency with most technologies, not all students were proficient. While students made similar comments about faculty, quoted earlier, they tended to focus their critique of faculty skills on hardware management, rather than software.

> *I spend an inordinate amount of time teaching students how to use basic software (spreadsheets, word processors, et cetera).*

In focus groups, faculty made frequent mention of students' enthusiasm for Internet resources, although some expressed concern that students were not finding quality information online.

> *I find students can manipulate machines and search for information, but they have very underdeveloped capacities to assess critically that information, combine it into complex analyses, and think deeply.*

Qualitative data supports this observation; faculty rated themselves significantly higher in resource skills than undergraduates did. Most interestingly, 55% of undergraduates rated their ability to critically evaluate information from the Internet and other sources as advanced or expert, as opposed to 67% of faculty: a 12% difference.

Looking at expertise in infrastructure, production, and resources reveals two key trends. First, both faculty and undergraduates rated themselves higher at some skills than others—both groups averaged intermediate-level skills in the infrastructure category, but advanced skills in the resources category. Additionally, significant differences exist between self-reported expertise for faculty and undergraduates within the production and resources categories.

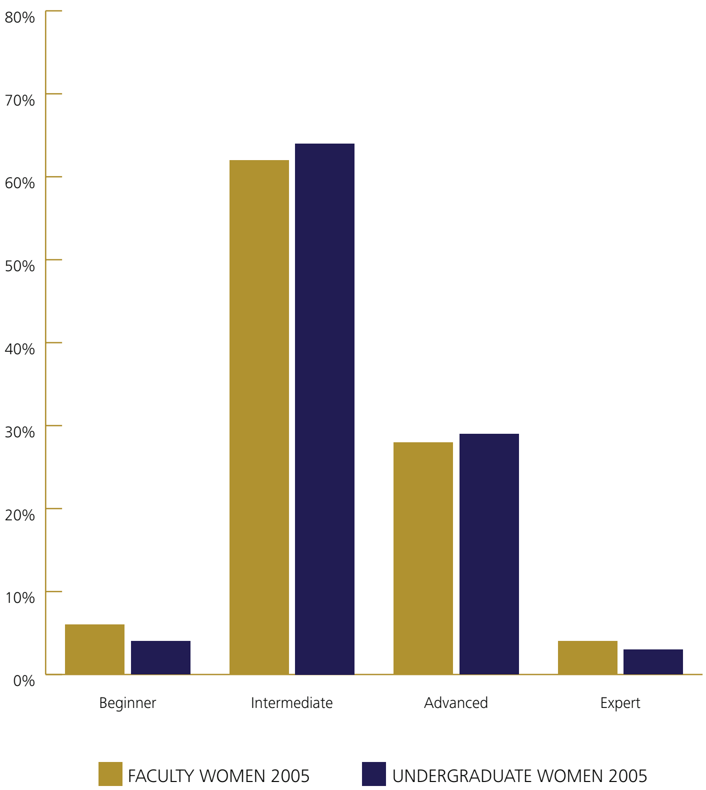
Demographic Influences

Taking demographic considerations into account complicates issues of expertise further. The gender differences between faculty and undergraduate survey respondents had a direct influence on their patterns of response. Recall that 61% of our faculty respondents were male, while 61% of undergraduate respondents were female. FIGURE 7 and FIGURE 8 break down faculty and undergraduate responses to the general expertise question by gender.

When we took gender into consideration, very different expertise patterns emerged. While undergraduate women and faculty women reported virtually identical levels of expertise, there was a substantial technological divide between undergraduate men and faculty men. When the advanced and expert categories were totaled, only 32% of undergraduate women and faculty

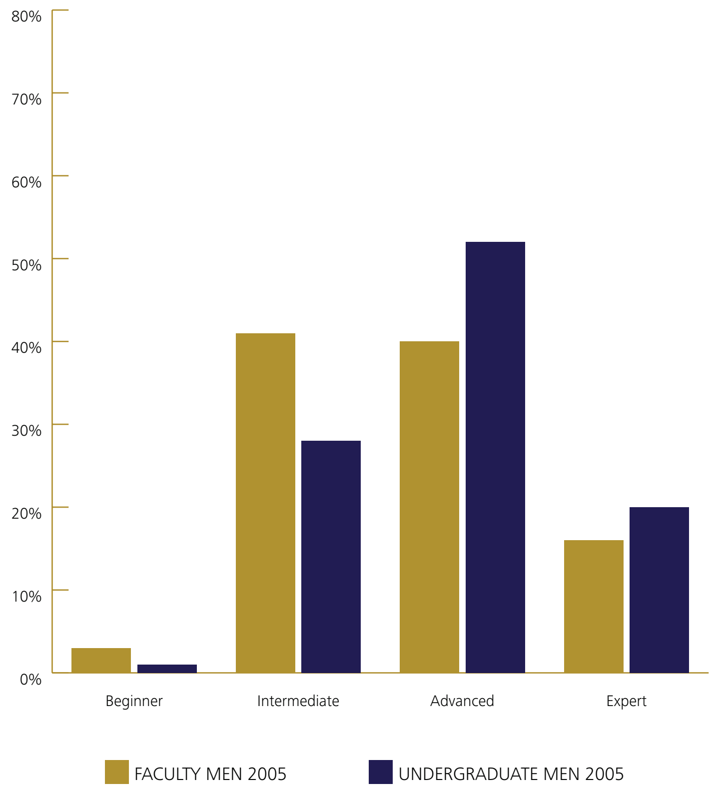
GENERAL EXPERTISE: WOMEN

FIGURE 7



GENERAL EXPERTISE: MEN

FIGURE 8



women placed themselves in the upper levels of the expertise spectrum. However, 56% of faculty men rated themselves as advanced or expert, along with 72% of undergraduate men. Not only do these numbers demonstrate significant differences in self-reported expertise between the genders, but they also highlight another trend that goes against conventional wisdom: the gender gap on expertise was wider for undergraduates than it was for faculty members.

Some of the reasons that faculty women were closer to faculty men in self-reported expertise may involve differences in age within the faculty population. While the average age for undergraduate women and undergraduate men was the same, faculty women are, on average, three years younger than faculty men. Our analysis reveals a negative correlation between age and expertise—the younger respondents rated their expertise higher.

Similar demographic influences were also apparent within the three categories of expertise, although they were more prominent within particular categories than others. Men dramatically outpaced women in infrastructure, with the mean for undergraduate men at 2.56, for faculty men at 2.26, and undergraduate and faculty women at 1.64. Thus, women averaged between beginner and intermediate in this category, while men fell between intermediate and advanced. However, the gap narrowed for production and disappeared for resources.

We began this section with a comparison of faculty and undergraduates' general expertise rating. We noted that discrepancies in qualitative and quantitative data surround this expertise comparison: quantitative data placed the two groups on par in terms of technological proficiency, while qualitative data suggested that undergraduates' technological skills may outpace those of faculty members. Longitudinal data showed similar expertise levels between faculty and undergraduates, but looking at specific categories of expertise revealed important differences between these groups in their arenas of knowledge. The gender differences discussed above further complicated the issue and raised important questions: Are the patterns revealed here differences in actual skill or perceived skill? Are these gender differences consistent throughout the survey? While our instruments are not adequate to answer the first question, we will continue to investigate the second question throughout the remainder of this report.

Technology Use

The instructor and student surveys included two different types of questions about technology use. The first asked participants to select from a long list of technologies the ones that they use and indicate their frequency of use. The second type of question focused on participants' use of various general-access technology facilities and services, such as computer labs and the Center for Teaching, Learning, and Technology.

General Technology Use

In our analysis, we focus on the range of technologies undergraduates and faculty members use for their learning or instruction, rather than on how often they employ particular technologies. In order to identify the most widely used technologies on campus, we used the following method. First, we identified twenty-four technologies that were included on both surveys and tallied their overall use across all populations: undergraduates, graduate students, faculty members, teaching assistants, and others. Next, we divided this list into four equal parts, generating four tiers of technology, each containing six items. FIGURE 9 presents the four tiers, along with the percentage of users for each technology.

It is not surprising that more conventional technologies, such as word-processing software and desktop and laptop computers, are firmly established in the first tier. The technologies in the second tier indicate the most influential emergent technologies at this University. The clustering of graphics software, digital cameras, and Web-authoring software at the cusp between the first

EDUCATIONAL TECHNOLOGIES
FIGURE 9

TECHNOLOGY	PERCENTAGE	TECHNOLOGY	PERCENTAGE
Tier 1		**Tier 3**	
Word-processing software	94%	Digital music player	17%
Desktop computer	87%	Cell phone for text messaging	14%
Spreadsheet software	82%	Video-editing software	14%
Presentation software	75%	Web-based file storage	13%
Laptop computer	75%	Peer-to-peer file sharing software	11%
Graphics software	49%	Audio-editing software	9%
Tier 2		**Tier 4**	
Digital camera	43%	Online music store	8%
Web-authoring software	32%	Collaborative Web-editing software	8%
Database software	31%	Social/collaborative services	8%
Instant messaging	24%	Tablet PC	7%
Personal digital assistant	19%	Cell phone for Web surfing	5%
Web-based journals	18%	RSS readers	5%

and second tiers indicates significant use of visual elements and format- to support instruction and learning.
After generating the four tiers above, we used them to compare levels of technology use across different populations. FIGURE 10 compares undergraduates and faculty members, based on the total numbers of technology that they used from each tier: a rating of one indicates that, on average, respondents used one of the six technologies in that tier; a rating of four indicates that, on average, respondents used four of the six technologies in that tier.

While faculty outpaced undergraduates on the use of Tier 1 and Tier 2 technologies, those that are more established at the University, undergraduates used more technologies in Tier 3 and Tier 4. Overall, undergraduates were more likely to employ a wider array of technologies for course activities, while faculty tended to favor fewer, more established, technologies.

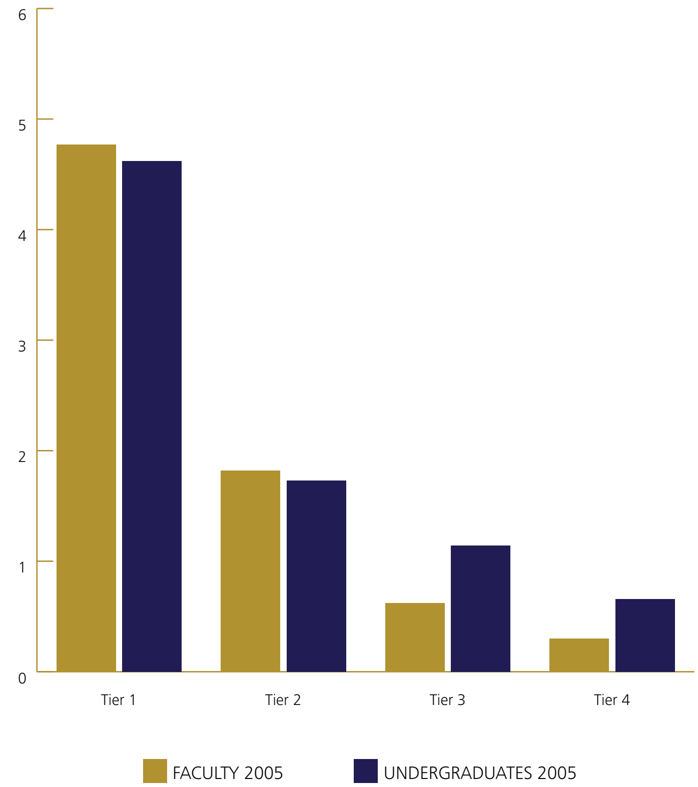
Demographic Influences

As with expertise, demographic influences impacted data on technology use. FIGURE 11 and FIGURE 12 compare the use of technologies in each tier by group (undergraduates vs. faculty) and gender.

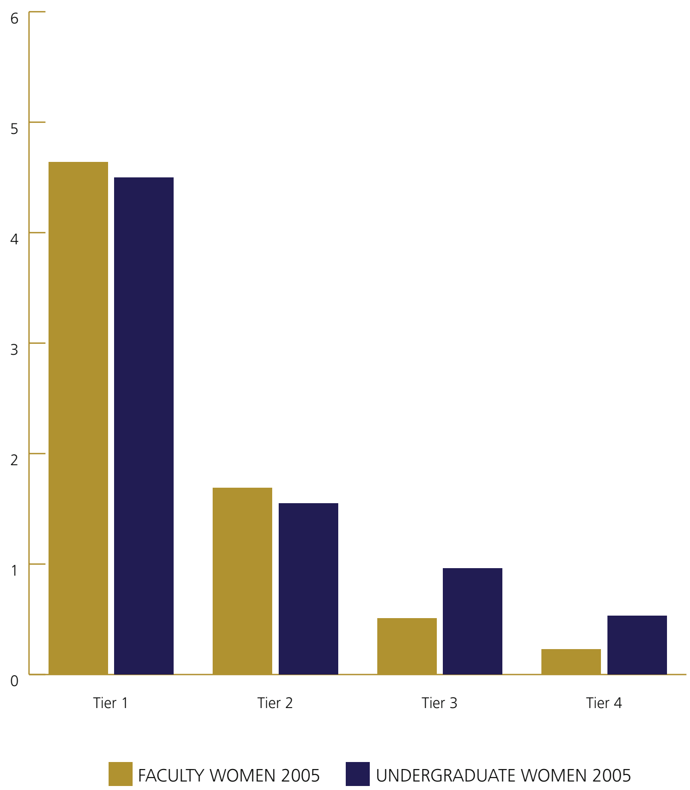
Several significant patterns emerge from this comparison. Most importantly, similar to the data on expertise, the number of different technologies used by men was larger than the number used by women: men's ratings were higher than women's for the top two tiers—representing conventional technologies and the most widely-used emergent technologies. Once again, there was a wider gap between undergraduate men and women in the use of these technologies than appeared for faculty men and women.

When we examine Tier 3 and Tier 4 technologies the landscape changes. For these technologies, group membership (faculty or student) had more impact than gender in determining use, although gender still had some influence. Undergraduate women used more technologies in the final two tiers than were used by faculty men, with faculty women using these technologies the least. The data suggest that gender differences in technology use are more pronounced for conventional, established technologies than they are for newer technologies.

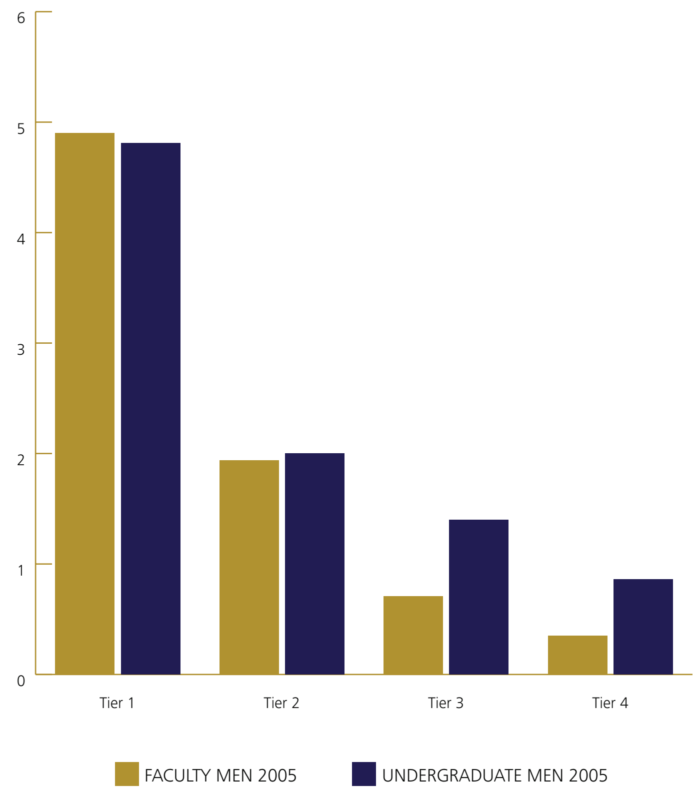
TECHNOLOGY USE
FIGURE 10



TECHNOLOGY USE: WOMEN
FIGURE 11



TECHNOLOGY USE: MEN
FIGURE 12



This pattern further complicates our data on technological expertise. All of the technology-specific expertise questions in the surveys focused on Tier 1 and Tier 2 technologies. It is possible that undergraduate women would be more likely to bridge the gender gap on questions about Tier 3 and Tier 4 technologies. The implications of these trends are significant for the University community. Using established educational technology in courses may privilege undergraduate men. To combat this tendency, faculty should be sure to provide explicit instruction for all technology skills required of undergraduates in their courses.

Use of Technology Facilities and Services

In addition to asking questions about the use of different technologies, we also asked students questions about their use of computer labs and other general-access technology facilities and services. Undergraduate responses indicated that they frequented several types of labs on a regular basis: 75% used general-access labs, 47% used departmental labs, and 77% used library labs. The most common reasons given for using the labs were their convenient locations and hours. During focus groups, both faculty and students expressed high praise for the resources available in campus computing centers. According to one faculty member, quality labs allowed for more technological options in courses.

> *No longer is there any "I can't get access to a computer" or "there's a long line at the computer lab" or "I couldn't print it" or "we didn't have the right software." They're [labs] everywhere, they're all over the place, they're readily available, and they're economical to use. So I can freely give assignments and have projects and homework that require a computer now and students can go and do them. The technical help is good; they can get help in the labs.*

A student expressed a similar opinion, while also emphasizing the value of convenience.

> *I have actually really enjoyed all the computer labs available on campus, like the fast Internet connection, being able to go to almost any building and there's a technology resource available. Like Odegaard, having it open 24 hours has been awesome—just knowing that at any time I could go there and do my stuff.*

The qualitative data gathered from instructors also calls attention to the value of The Center for Teaching, Learning, and Technology, where Catalyst Web Tools are developed and supported. Although there were no direct questions about Catalyst on the survey, faculty members mentioned Catalyst frequently in focus groups and in their general comments at the end of the survey. Overall, faculty made 132 unprompted mentions of Catalyst. Of these, 104 were positive, 18 were negative, and 10 were neutral. The few negative comments focused on challenges encountered with a particular tool, advanced users' preferences to do things on their own, and concerns that Catalyst tools did not adequately meet all needs on campus. Positive comments included the usefulness of particular tools, the value of the training and support offered by Catalyst, the benefit of being able to learn at one's own pace and pick up new tools and new skills over time, and the ability to use Catalyst tools both within and outside of a course context. Most faculty members who made comments about Catalyst focused on the support and assistance they received. The following comment is typical.

> *I have been helped enormously by Catalyst. The Catalyst staff helped me put together an interactive course Web site with syllabus and course information, announcements, email discussion board, electronic submission of papers, etc… Catalyst also helped me create a personal Web site.*

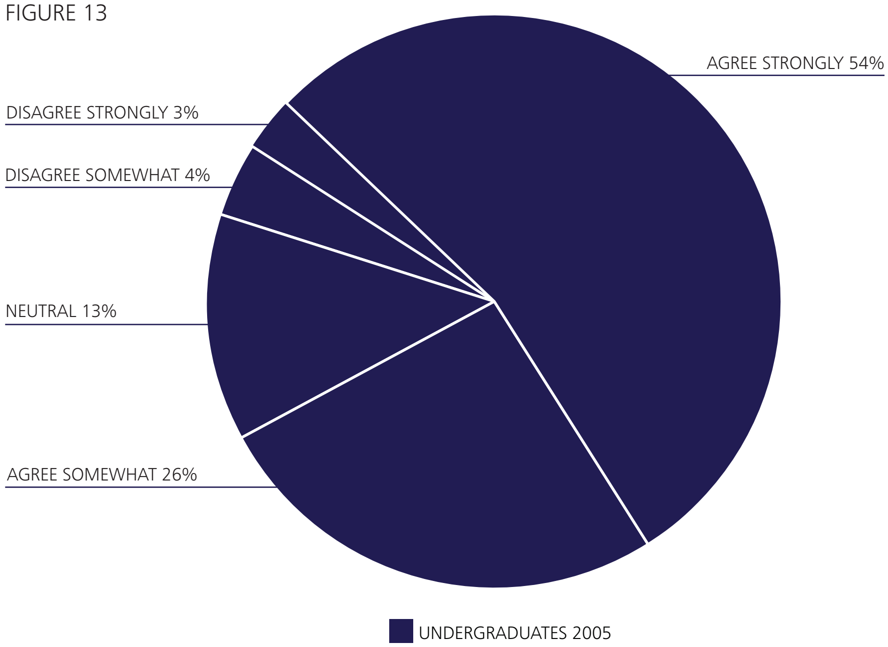
Data on the use of particular technologies and general-access facilities and services indicate that a large number of faculty and undergraduates are taking advantage of the resources available to them at the University. It emphasizes the quality support that we currently offer at the University of Washington, but also allows us to envision new dimensions to that support that will be necessary in the future as different technologies become more widely used at the University. We discuss some of these emerging trends more fully later in this report.

Perspectives on Technology

The instructor and the student surveys posed a series of questions about technology goals. One of these questions began with "The UW should…" and then asked respondents to rate their level of agreement with the various phrases that completed the sentence. For example, "The UW should require all courses at the UW to have a course Web site." A comparison of faculty members and undergraduates' desired goals demonstrates the different priorities held by each group.

Undergraduate Students

REQUIRE COURSE WEB SITES
FIGURE 13

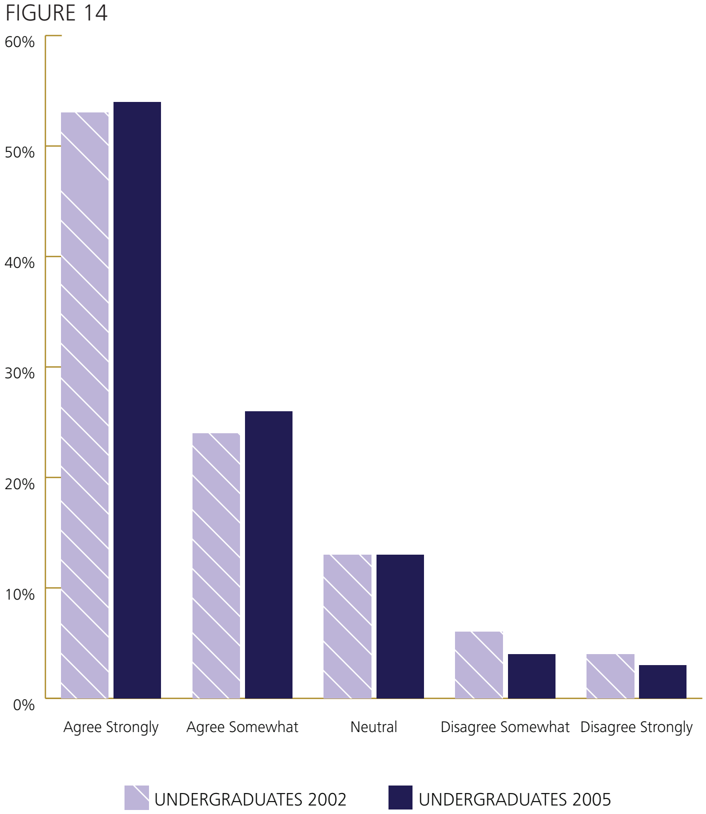


When asked what the University should do in the future, an overwhelming majority of undergraduates prioritized developing and enhancing online information. On the student survey, 80% of undergraduate students expressed some level of agreement with a statement about required course Web sites (quoted above). FIGURE 13 graphs student response to this question on a five-point scale.

In focus groups, student responses highlighted a desire for improvements to Web-based resources. At the end of each session we asked students to look towards the future: "Dream a little dream! If you could do anything you wanted with technology to support your learning what would it be?" Most students' dreams were quite practical and had immediate short-term benefits: they asked for access to specific tools, for basic course information to be available online, and similar technological resources. While one student wanted video-conferencing with her peers in Asia, most students' dreams stayed close to home. One student's response summarized a sentiment voiced by many of his peers:

> *Something that would help support my learning would be having more information about a course online, especially requiring professors to put a syllabus on a Web site. It would be nice to look on the teacher's Web site and see all the assignments. That would be fantastic.*

REQUIRE COURSE WEB SITES
FIGURE 14



Another student expressed the same view in a manner that echoed the phrasing of our survey question, "I think every course should have a home page on the Web." Whether prompted by a direct question on the survey or asked to think generally about their goals and desires, undergraduates gave online resources high priority.

The results from the 2002 student survey demonstrated a similar pattern. In 2002, students were given several versions of the student survey; different versions asked differed questions. Approximately half of the undergraduates surveyed that year were asked to respond to goal-oriented questions, including a statement about requiring course Web sites. FIGURE 14 compares responses from undergraduates in 2002 and 2005. As you can see, undergraduates' opinions on this issue have not changed: they expressed a strong desire for required course Web sites in 2002 and they continued to articulate that desire in 2005.

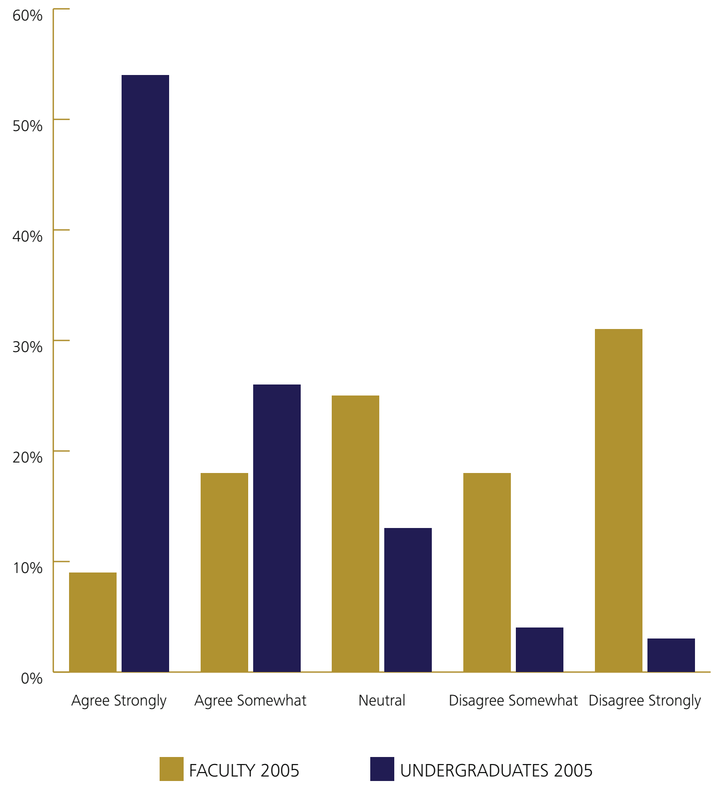
While 2005 undergraduate students responded to the survey question about requiring course Web sites in a manner virtually identical to their 2002 counterparts, 2005 undergraduates and faculty members had very different opinions on this issue. FIGURE 15 compares faculty and undergraduate responses. While 54% of undergraduate students strongly agreed with this statement, only 9% of faculty members agreed. Faculty members were not merely neutral; 49% selected "disagree somewhat" or "disagree strongly." The divergent opinions of faculty members and undergraduate students on this issue represent the widest divide between these two populations on any item surveyed.

Another question asked on both the 2005 instructor and student surveys focused specifically on types of online resources. It asked both groups to rate the importance of various components of course Web sites. According to undergraduate students, the most important items included course syllabi, lecture notes, and problem sets or exercises: for faculty, the top three items were course syllabi, course reserves/archives, and problem sets or exercises. While faculty and students agreed on two out of three items, the option of putting lecture notes online was another issue that divided these two groups. FIGURE 16 compares responses for this item.

In focus groups and the open-ended question at the end of the survey, students and instructors voiced different perspectives on lecture notes. Instructors were concerned that students would be less likely to attend class if lecture notes were available online. Students expressed that having access to lecture notes helped them study and better understand course information. According to one instructor, lecture notes and other types of online information had an impact that extended beyond whether or not students attended class sessions.

REQUIRE COURSE WEB SITES

FIGURE 15



In many ways, technology has helped the student do less and less and made the instructor do more. Spoon-feeding them a Web-posted, day-to-day course syllabi can easily hamper the ability to pursue interesting issues that spontaneously come up. Too many students are no longer comfortable if it isn't all laid out beforehand in black and white (better if it is flashy). Not a good formula for effective education.

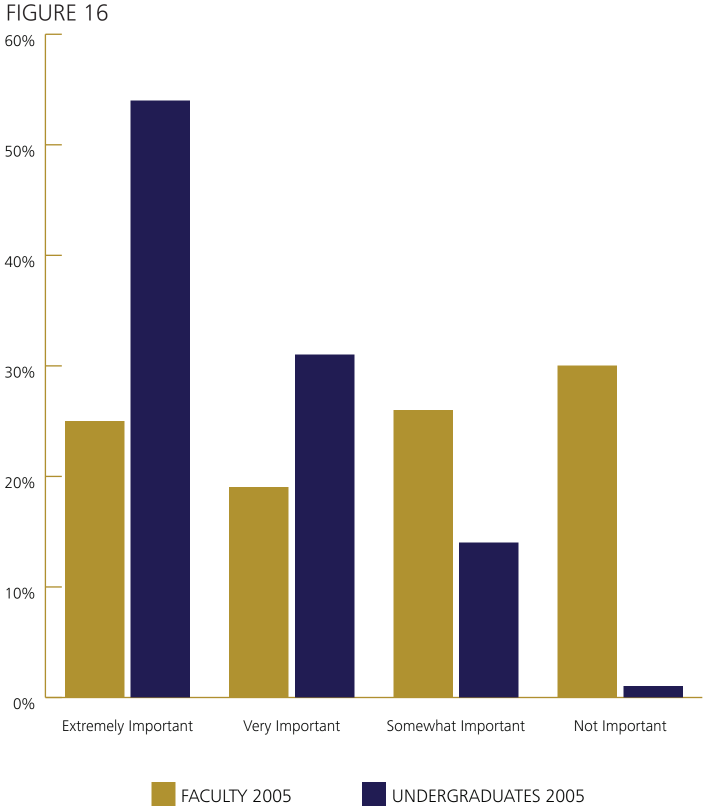
Qualitative data from students counters these concerns with descriptions of what can be gained from having online access to course materials.

Some people have different learning styles. If you are in a big lecture hall you don't want to sit there the whole time and jot down everything the teacher says, because you don't get everything as well. If you sit and actually listen, you get a lot more of it. And then you could get the notes later [online].

The two opposing perspectives evident in these quotes demonstrate the complexity of this issue. While faculty and

ONLINE LECTURE NOTES

FIGURE 16

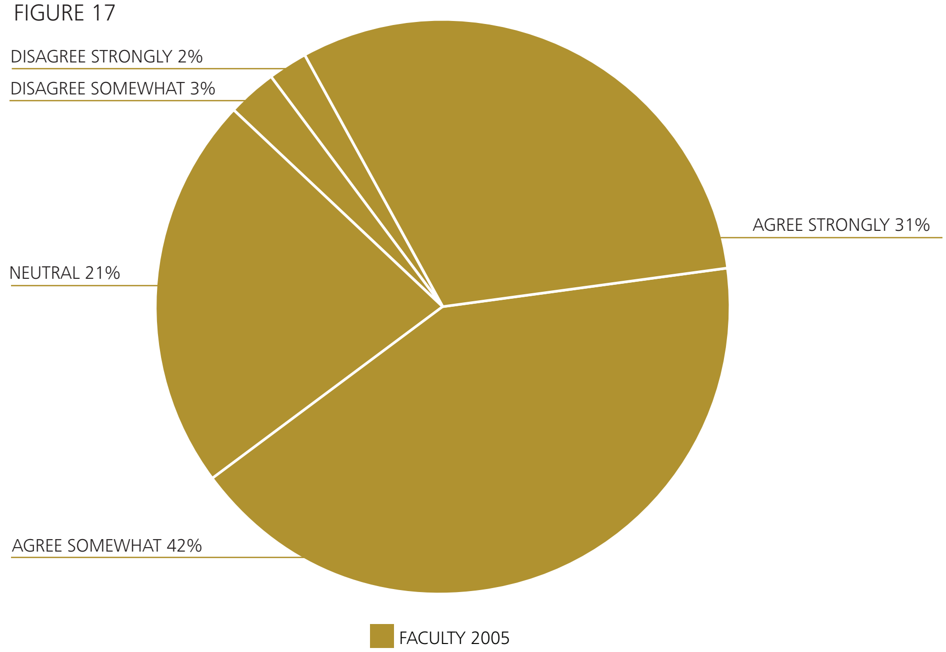


undergraduates have different opinions on what should be required for the University, it is clear from their comments that both groups have given considerable thought to the impacts, both positive and negative, that online information has on teaching and learning.

Faculty Members

Undergraduates' desire for more online course resources was consistent with larger trends in the data. In general, undergraduate students looked to faculty members to provide them with additional support. On the other hand, faculty looked to the University to provide solutions to technological needs. For faculty members, the goal that garnered the strongest positive response was, "The UW should provide more opportunities for faculty to use technology to support their instruction." FIGURE 17 shows the distribution of responses.

PROVIDE OPPORTUNITIES TO USE TECHNOLOGY
FIGURE 17



The quantitative data collected in the instructor survey does not provide a conclusive account of what these additional opportunities should include. However, evidence from qualitative data, from focus groups and survey comments, highlight faculty members' desire for additional technological resources in classrooms. In both venues our questions were general and open-ended.

Although we did not ask specific questions about classroom technologies in either forum, the desire for improvements in this area dominated faculty comments. All forty of the instructor focus group participants expressed some level of dissatisfaction with existing levels of classroom technology. Approximately half of the instructors that completed the survey left comments at the end. Of the comments provided, approximately 35% involved classrooms. Top concerns expressed by instructors included the following: lack of certain technologies (such as computers with projection) in many classrooms, encounters with unreliable equipment, inconsistent technological infrastructure across campus classrooms, and frustration with "schlepping" equipment (projectors, DVD players, laptops) to and from unequipped classrooms. The quotes from instructors listed below, indicate the range of comments on this issue.

> *The thing I would add is more electronically-equipped classrooms like the ones at Mary Gates Hall around campus.*

> *The point is that we are so keen on preparing things using technology, but if the classroom does not support technology then it doesn't mean anything.*

> *It has been a hindrance that there's no sort of standardization across the University.*

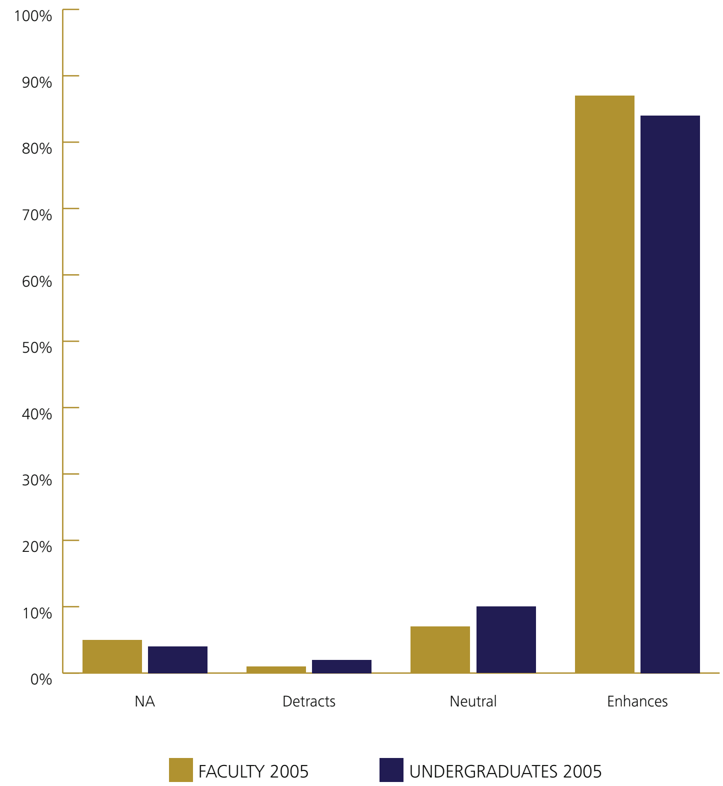
Access to equipment in classrooms has a direct impact on whether or not faculty members invest the time to use technology in their courses. According to one instructor, access to a tech-equipped classroom for one quarter was not enough; instructors needed to be able to count on consistent access.

> *Most lecture halls are equipped with the appropriate technology, but most small classrooms are not. If you invest the time to use technology in a 50-person class and don't know if you are going to get the same classroom every year, the significant cost of transformation may not pay off in the event that you do not get an equipped classroom again.*

The instructor and student surveys did not ask general questions about classrooms. They did include, however, a question about the impact that various technologies had in a seminar classroom (defined as 20-30 people). We asked respondents to indicate whether or not each technology listed enhanced, detracted, or had no impact on teaching and learning. For faculty, the top three technologies that enhanced instruction in a seminar classroom were computers with projection, overhead projectors, and TV/ VCRs. Interestingly, the only item on this list that is not currently standard in classrooms of this size was the top-rated item: computers with projection. Undergraduate students also gave this item the highest ranking. FIGURE 18 compares responses. It is also important to note that no technology listed received its highest marks from faculty or undergraduates in the "detracts" column. This indicates that both groups do not tend to see technology as an impediment to educational activities.

Although undergraduates agreed with faculty members that access to technology in seminar classrooms enhanced their educational experience, they did not agree with faculty on all issues surrounding classroom technologies. Most significantly, while faculty voiced substantial complaints about unreliable classroom equipment, students complained about a different issue: the lack of technological prowess among faculty members. Student opinion on this issue is summarized by the quotes below.

COMPUTER WITH PROJECTION
FIGURE 18



I feel like the instructors should know how to use the tool better and have to take classes! I have been in so many classes where they have NO clue how to set things up and class time is wasted.

What have not been so helpful [to my learning] are instructors that are unfamiliar with the tools they are using. I think instructors could use professional development support so they are confident using the technologies at their disposal and understand how their students are using technologies.

In general, undergraduate students preferred that instructors used technology in the classrooms; however, at times they found that instructors' difficulties in execution made technology more of a hindrance than an enhancement. Although faculty and students ascribed some of the current problems with classroom technologies to different sources (faulty equipment versus lack of faculty training), it is clear that both groups would benefit from seeing these patterns change. The fact that the issues surrounding access to technology in classrooms dominated the qualitative data, without prompting from the research team, demonstrates that this issue is central to the future of educational technology at the University of Washington.

Demographic Influences

Unlike expertise and technology use, demographic influences did not exert significant influences over perspectives on technology, with the exception of divisions in age. Younger respondents, particularly undergraduates, showed more interest in opportunities to use a greater variety of technologies. In particular, undergraduates expressed more interest in collaborative technologies, such as computers for small group work and online discussion spaces. Younger faculty members were more inclined to share these interests than their older counterparts. Gender differences had little consistent influence on opinions about the path the University of Washington should pursue in the future. In this area, divisions between faculty and undergraduates, driven by differences in age and experience, had the greatest influence.

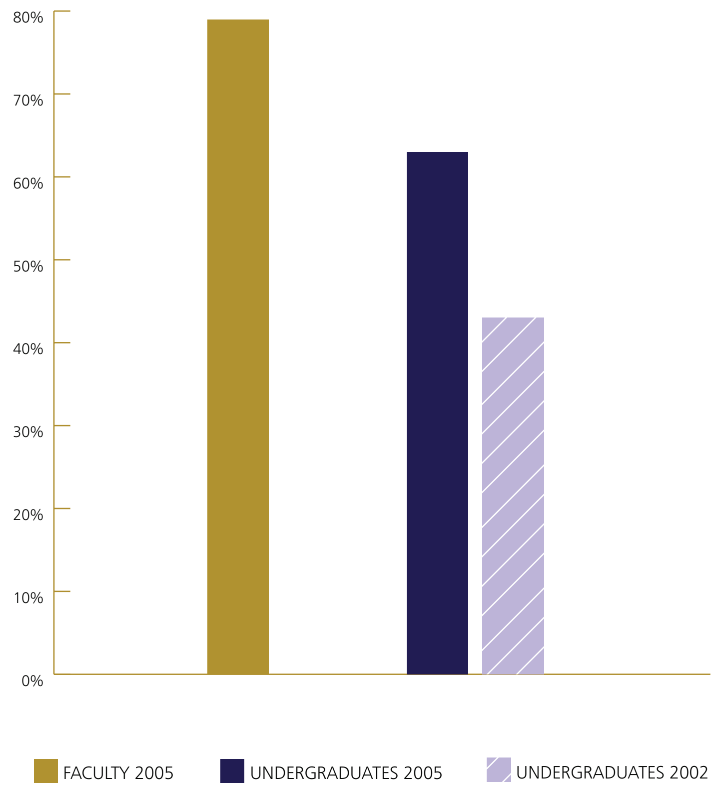
The perspectives on technology shared by undergraduates and faculty members imagine a more pervasive technological environment on campus—one where more classrooms are equipped with technology and where more resources are available online. Our data suggest that if the University community were to make progress towards either or both of these goals it would have a substantial impact on teaching and learning. Faculty would be able to use more resources in their courses, try new things in the classroom, and invest time in technology without fear of their effort being wasted for future classes. Undergraduates would be able to access a wider array of resources online and could use Web-based information to expand their understanding of course materials.

Emerging Technologies

While classroom technologies and online resources represent two key areas where faculty and/or undergraduates made direct requests for improvements to the University's technological infrastructure, additional survey data pointed to other technologies that were gaining momentum at the University of Washington: laptop ownership was on the rise, interest in Web-based tools was high, and synchronous communication technologies (i.e., instant messaging) were popular as academic tools.

Laptops and Wireless

LAPTOP OWNERSHIP
FIGURE 19



On the 2005 instructor and student surveys we asked a series of questions about laptop ownership and the use of the University's wireless network. FIGURE 19 shows the current rate of laptop ownership for undergraduates and faculty members. As the data show, the majority of our respondents in both groups own laptops. The figure also compares laptop ownership among undergraduate students who completed 2005 and 2002 surveys. There are some limitations to this data: on the 2002 survey only a half of the undergraduate respondents were asked questions about laptops. The 2001 instructor survey did not ask about laptop ownership. Even when these limitations are taken into account, it is clear that laptop ownership is on the rise among undergraduates.

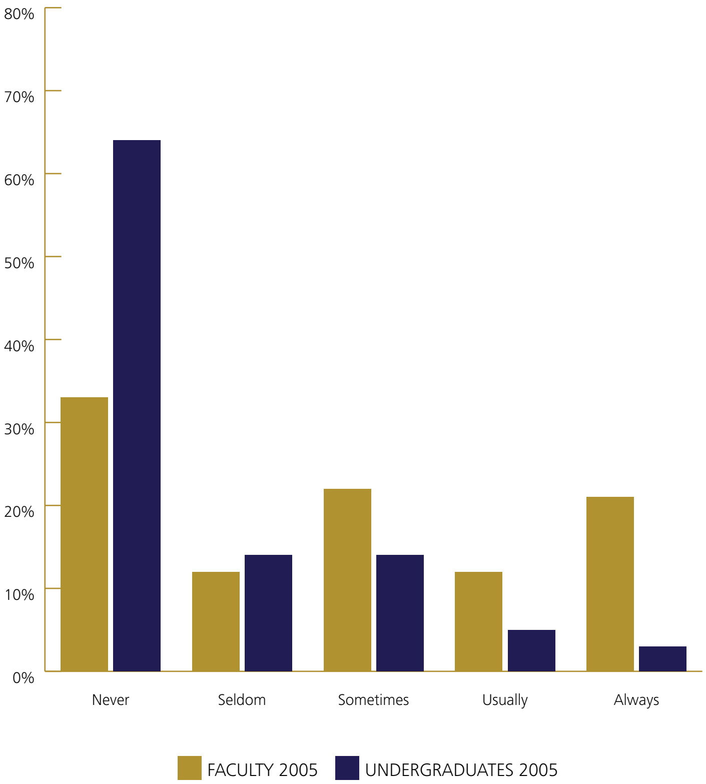
Although the majority of faculty and undergraduates reported owning laptops, most of them were not inclined to bring their laptops to class on a regular basis. FIGURE 20 presents the regularity with which both groups reported bringing their laptops to class. Qualitative data suggest two key reasons that a higher percentage of users do not use laptops in class with greater frequency: laptops are heavy and wireless access is spotty. On the surveys we also asked faculty and undergraduate laptop owners whether or not they would bring their laptops to class if wireless were available. FIGURE 21 presents their responses.

According to the data, the presence of laptops in classrooms is likely to increase dramatically with the availability of wireless access; 35% more undergraduates and 17% more faculty reported that they would bring their laptops to class sometimes, usually, or always. It is interesting that the numbers jumped more for undergraduates than they did for faculty. This discrepancy may be due to the fact that a higher percentage of faculty members are already using their laptops in class. It could also relate to discrepancies in equipment between faculty and students. While 82% of undergraduate laptop owners reported that their laptop had wireless capability, only 73% of faculty reported the same. Even though a higher percentage of faculty owned laptops, their laptops were less advanced than undergraduates' machines.

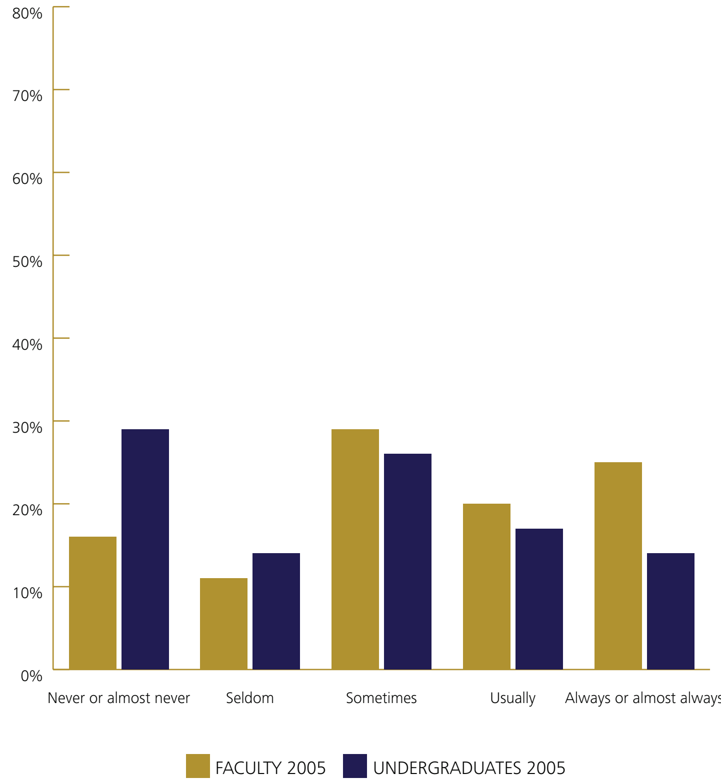
The University's strategic plan calls for wireless access across the entire Seattle campus within the next three years. Based on survey data, it appears that as more and more classrooms are equipped with wireless, more and more undergraduates and faculty will bring laptops with them to class, changing current patterns significantly. In focus groups, we asked both instructors and students to share their thoughts on the plan to bring wireless to the Seattle campus. For the most part, both groups were enthusiastic about the plan, but not without reservations--the most substantial involved concerns that wireless and wireless devices could become a distraction during class. Students expressed both benefits and drawbacks of increased wireless access in classrooms.

> *The ability to get online whenever I need has a huge impact on my ability to look up study materials for class.*
>
> *Having the Internet in classrooms just encourages students to tune out, browse the Internet, watch videos, or do things other than paying attention.*

CLASSROOM USE OF LAPTOPS: CURRENT
FIGURE 20



CLASSROOM USE OF LAPTOPS (WITH WIRELESS)
FIGURE 21



In general, students in focus groups expressed more reservations over wireless in classrooms than faculty did. While a few students said that they currently used wireless access in tech-equipped classrooms for activities such as taking collaborative notes during lectures, most were not sure how wireless could be utilized in class.

Unlike students, faculty focused their conversation about wireless on the new opportunities that such access would afford. Faculty looked forward to being able to do more group activities, to taking students outside the classroom, to easily accessing files, and to incorporating more online resources into their day-to-day class activities. Some did express concern that while wireless was a powerful tool, on its own it would not have a significant impact on future academic activities.

> *My concern about a wireless policy all over campus would be that wireless would be there, but nothing that supports good teaching with wireless would be there.*

A student expressed a similar point of view.

> *The things that will make wireless really powerful will be new applications that begin to use that connectivity to do new things.*

The faculty and student opinions captured above indicate that harnessing the educative power of wireless technology takes more than making it available across campus. Educational activities need to expand to take advantage of the new opportunities made available by wireless.

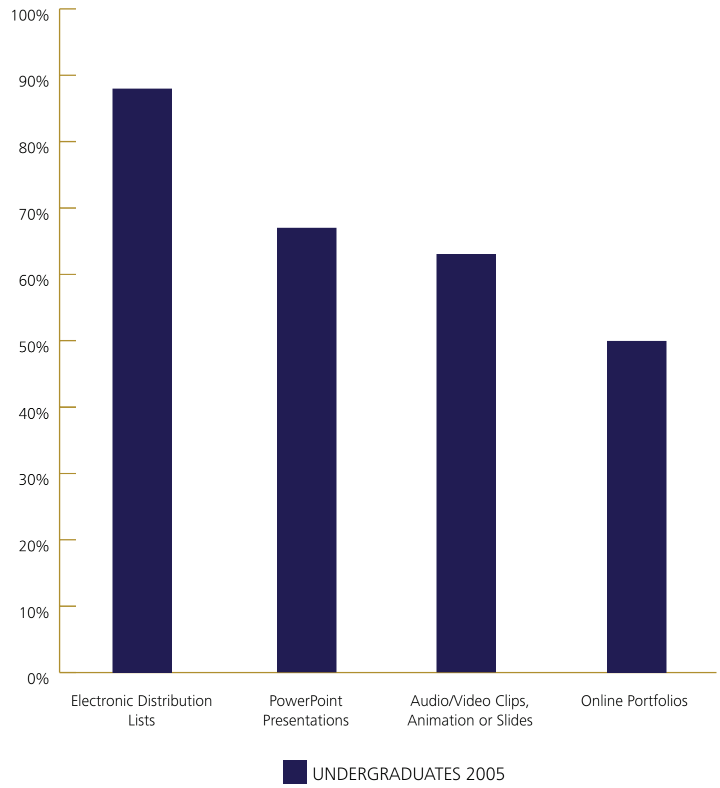
Web-based Tools

On the student survey, we listed eight different technologies and asked respondents to select the ones they would like to see instructors use in their courses. FIGURE 22 presents the four technologies that received the highest marks from undergraduates.

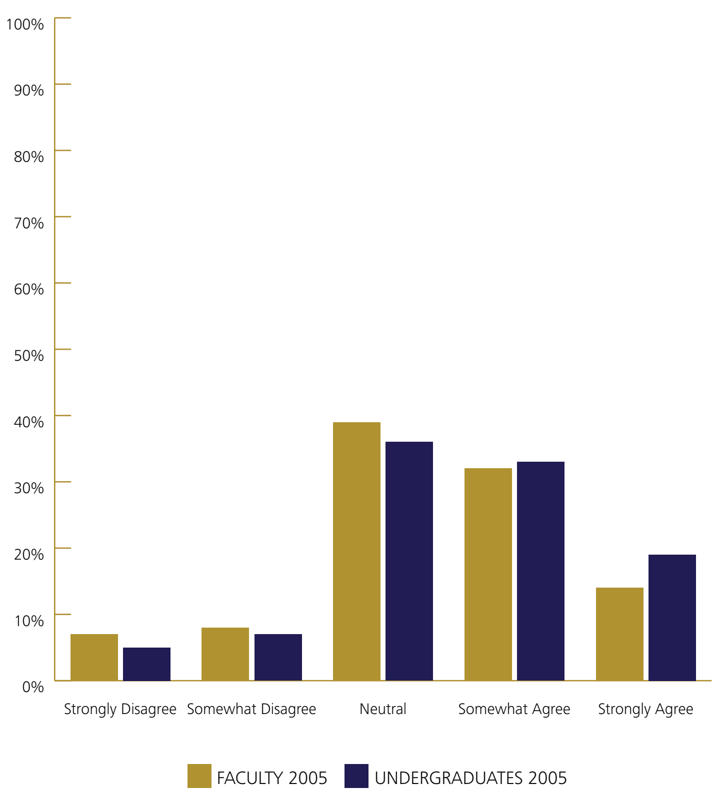
The technologies that received the top response rates were not surprising. More interesting was the item that received the fourth-highest marks: online portfolios for class projects. Exactly 50% of undergraduate respondents indicated that they were interested in having instructors use this tool for their courses—12% more interest than was given to streaming video. The instructor and student surveys included another question about online portfolios. Respondents were asked to indicate their level of agreement with the following statement: "The UW should provide students with guidance in building online portfolios of their work and accomplishments." FIGURE 23 graphs faculty and undergraduate response to this question.

As the graph indicates, more faculty and undergraduates agreed with this statement than disagreed or remained neutral. This indicates a strong level of interest in online portfolios within both populations. This interest, however, appears to outpace the use of this technology at the University. On the instructor survey we included online portfolios for class projects in one of the questions for technology use: 86% of faculty indicated that they had never used this technology. We did not ask the same question on the student survey. Regardless, online portfolios appear to be a technology that captures the interest of both undergraduates and faculty members.

DESIRED COURSE TECHNOLOGIES
FIGURE 22



SUPPORT ELECTRONIC PORTFOLIOS
FIGURE 23



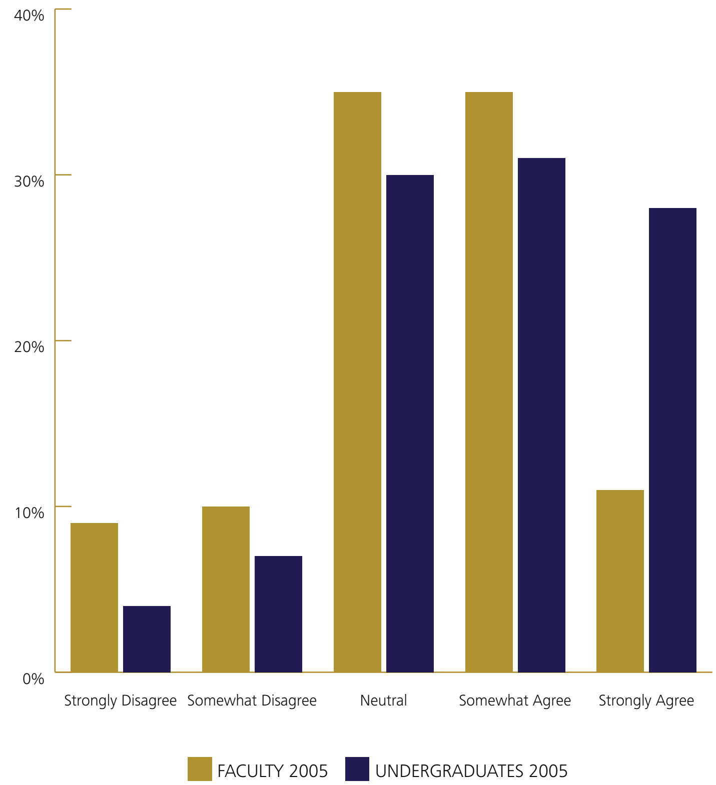
Other online tools also garnered the attention of faculty and undergraduates. In addition to asking about online portfolios, we also asked both groups to express their level of agreement with the following: "The UW should encourage instructors to use Web-based tools for student discussion and collaboration." Interest in these tools was quite high: 59% of undergraduates expressed some level of agreement and 46% of faculty members shared that opinion. Neither group disagreed with this objective; although there were significant numbers who were neutral on the issue, see FIGURE 24. The numbers for these types of Web-based tools were slightly higher than the numbers for online portfolios; however, their frequency of use was also higher. On the faculty survey we asked about the use of online discussion boards: 49% of faculty indicated that they had some level of experience with this technology. We did not ask the same question on the student survey.

Instant Messaging

Instant messaging is another technology that received a high level of attention from undergraduate students. While 52% of undergraduates indicated that they used this tool, only 10% of faculty members indicated the same. However, the divide between populations in the use of this tool may not be problematic. When we asked undergraduates to indicate which technologies they would like to see instructors use for their courses, only 26% selected instant messaging.

In summary, our comparison of expertise, technology use, and perspectives between undergraduates and faculty members identifies several key issues that are important to the future of educational technology at the University of Washington. We need to better understand and address the expertise differences that exist between faculty and undergraduates, as well as between women and men. We need to support non-traditional technologies that have gained wide acceptance on campus. Over the next few years, we need to increase our understanding of how undergraduates are putting new technologies to academic use. We also need to investigate ways to make the pervasive computing environment desired by students and faculty a reality at our University. In the final section of this report, we offer some recommendations for working towards these goals.

WEB-BASED TOOLS
FIGURE 24

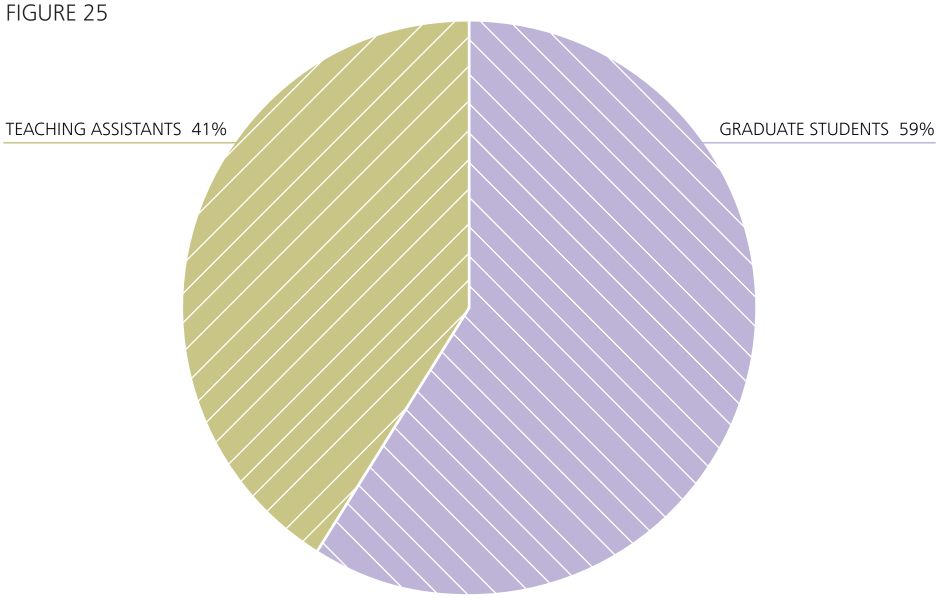


GRADUATE STUDENT AND TEACHING ASSISTANT COMPARISON

Demographics

Before we turn to recommendations for meeting the needs identified by our comparison of faculty and undergraduates, there is another segment of the University population that needs attention: graduate students. As discussed earlier, we divided the University of Washington's graduate student population between the student and instructor survey based on teaching status. For the purposes of reporting results, we refer to graduate students that completed the instructor survey and taught classes as "teaching assistants" and refer to those who completed the student survey and did not teach as "graduate students."

GRADUATE STUDENTS/TEACHING ASSISTANTS
FIGURE 25

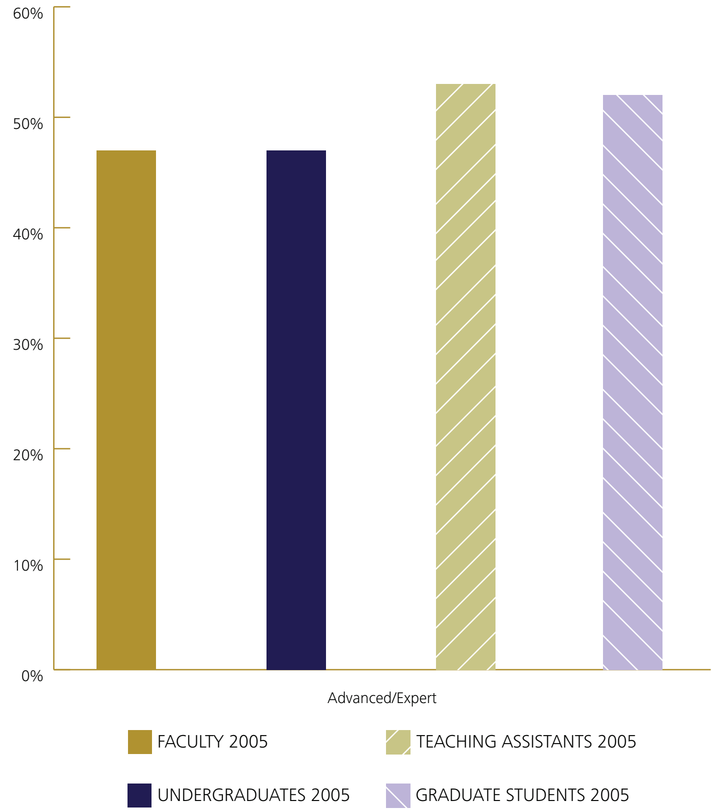


By the numbers, 411 teaching assistants completed the instructor survey and 286 graduate students completed the student survey, for a total of 697 participants from these two groups. FIGURE 25 shows the breakdown of teaching assistants and graduate students. While the total number of graduate students and teaching assistants approaches the numbers of undergraduates and faculty members, we decided not to combine results for teaching assistants and graduate students in our analysis. There are two reasons for this decision. First, the two groups completed different surveys, which asked them to respond from particular perspectives—as an instructor or as a student. Combining results would not to be true to the context of the surveys. Second, and more significantly, there were substantial differences in how graduate students and teaching assistants responded to survey questions. In this section, we highlight and discuss these points of divergence.

Within the graduate student group, 55% of respondents were in masters programs and 45% were in doctoral programs. The average age for graduate students was 32; for teaching assistants, the average was 29. The gender breakdown for this group was 39% male and 61% female—the same ratio as undergraduates. Within the teaching assistant group, 44% were male and 56% were female. In general, data for graduate students and teaching assistants revealed similar demographic influences on technology use and expertise that we saw with faculty and undergraduates; men tended to rate their expertise more highly and to use more technologies than women did. Since these patterns parallel those discussed earlier in this report, we will not discuss them in detail in this section.

GENERAL EXPERTISE

FIGURE 26



Expertise

In general, responses for graduate students and teaching assistants fit between undergraduate and faculty responses, bridging the differences between those groups. In this report, we focus on the items where patterns in the responses did not unfold in this predictable manner. These points of interest emphasize that graduate students and teaching assistants are unique populations with unique needs.

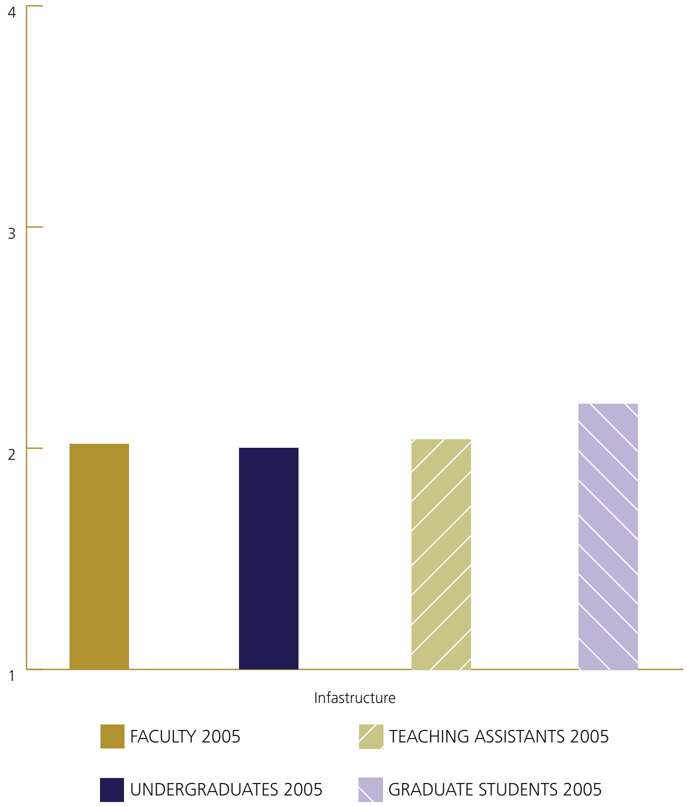
When we compared faculty to undergraduates, we found the two populations to be remarkably similar in terms of overall expertise with technology. FIGURE 26 adds graduate students and teaching assistants to the mix. To simplify the comparison between these four groups, we only graph the sum of responses in the advanced/expert categories, rather than all points along the four-point scale. Throughout this section we simplify data in a similar manner; we call attention to key points, rather than providing comprehensive coverage.

As FIGURE 26 demonstrates, graduate students and teaching assistants are similar to each other in their responses; however, respondents from both groups rate themselves significantly higher than both undergraduates and faculty. A similar pattern emerges for the three categories of expertise. FIGURE 27 compares undergraduates, graduate students, teaching assistants, and faculty on infrastructure skills. Remember, this category focuses on hardware and complex processes. Once again, graduate students and teaching assistants rate themselves higher than undergraduates and faculty. However, the point of interest is the high rating for graduate students. A similar pattern, although less pronounced, appears with production skills (not shown), as well as with resources (shown in FIGURE 28).

In the resources category the gap between undergraduates and graduate students is even more extreme than it is for the other categories, while teaching assistants and faculty look nearly identical. Unfortunately, our data cannot fully explain the reasons for this result. The discrepancy does raise interesting questions about relative expertise levels between different groups. Do graduate students tend to have higher skills in this area? Do graduate students' high expertise ratings translate to higher levels of technology use?

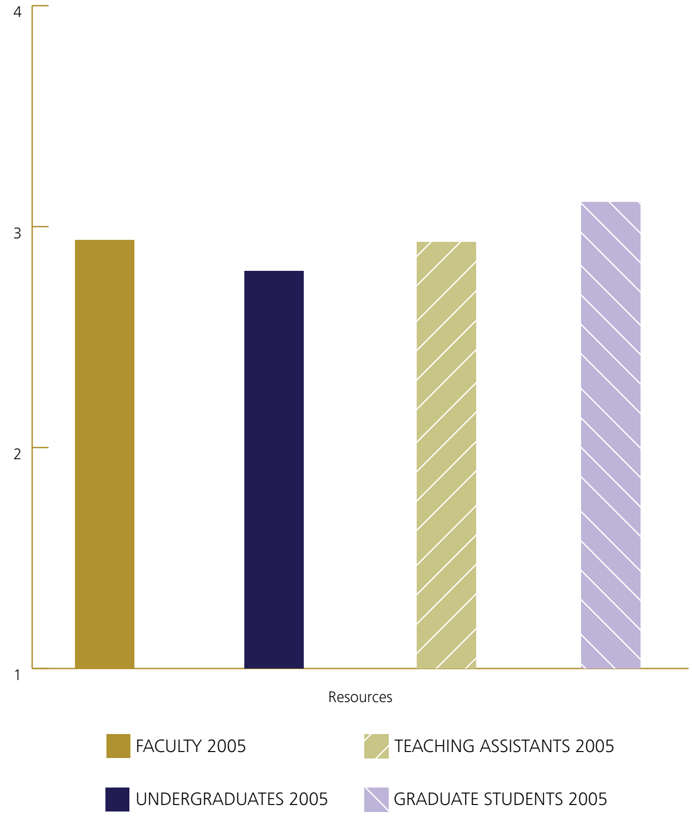
INFRASTRUCTURE EXPERTISE

FIGURE 27



RESOURCES EXPERTISE

FIGURE 28



Technology Use

The data for technology use among graduate students and teaching assistants were consistent with the patterns established in the expertise sections. In particular, this trend can be seen in a comparison of Tier 1 and Tier 2 technologies, shown in FIGURES 29 and 30. For a complete listing of the four technology tiers, see FIGURE 9.

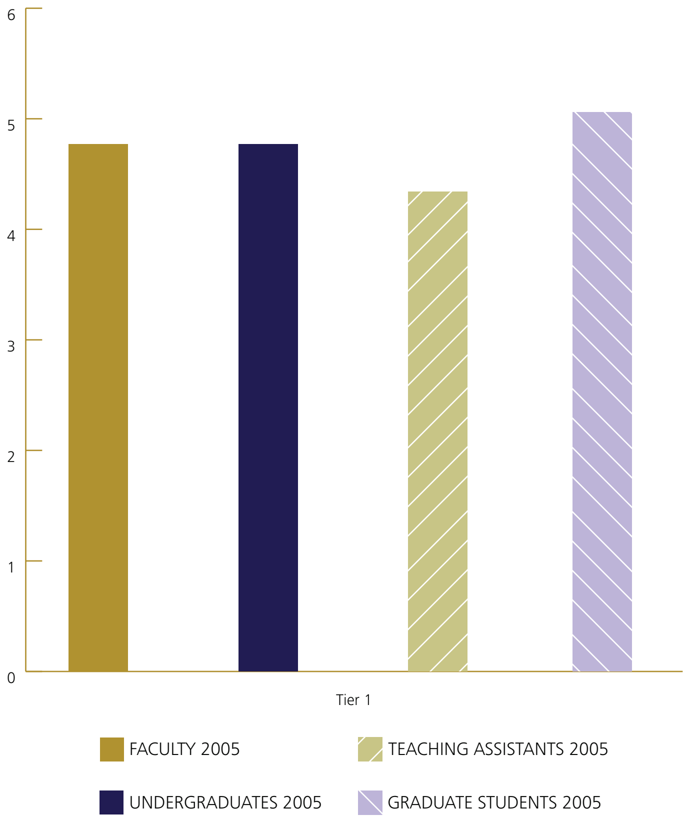
As the data indicate, graduate students used more Tier 1 technologies, on average, than any other group. Although they dropped to the same level as undergraduates for Tier 2 technologies, their level was still relatively high. Teaching assistants, on the other hand, use substantially fewer Tier 1 and Tier 2 technologies than any other group. Their lower levels of reported use were not consistent with their relatively high expertise scores. In instructor focus groups, one participant made a comment that focused on the level of skills demonstrated by students in his doctoral program. While it is not known from the data whether or not the students in question were teaching assistants or not, his comment was consistent with the trends in survey data discussed above.

> *Strangely enough I still find problems with graduate students worse than undergraduates. Perhaps it is simply that in my discipline I have graduate students who are allergic to technology and they didn't have anything to do with it. It's quite surprising to me that they won't deal with simple graphics and that kind of thing.*

Since the survey question presented above focused specifically on technology used to support teaching and learning activities, it is also possible that this trend had less to do with teaching assistants' skill level and more to do with the opportunities that they have to use technology in the courses they teach. Data from other areas of the survey, in particular the use of multimedia and computer classrooms, presented the same pattern—teaching assistants were less likely to teach in these spaces than faculty. When teaching assistants did teach in high-tech classrooms, they were also less likely to make use of the technology. Since teaching assistants represent the next generation of faculty, this pattern does raise the concern that these educators may not be gaining familiarity with educational technology during their time at the University of Washington.

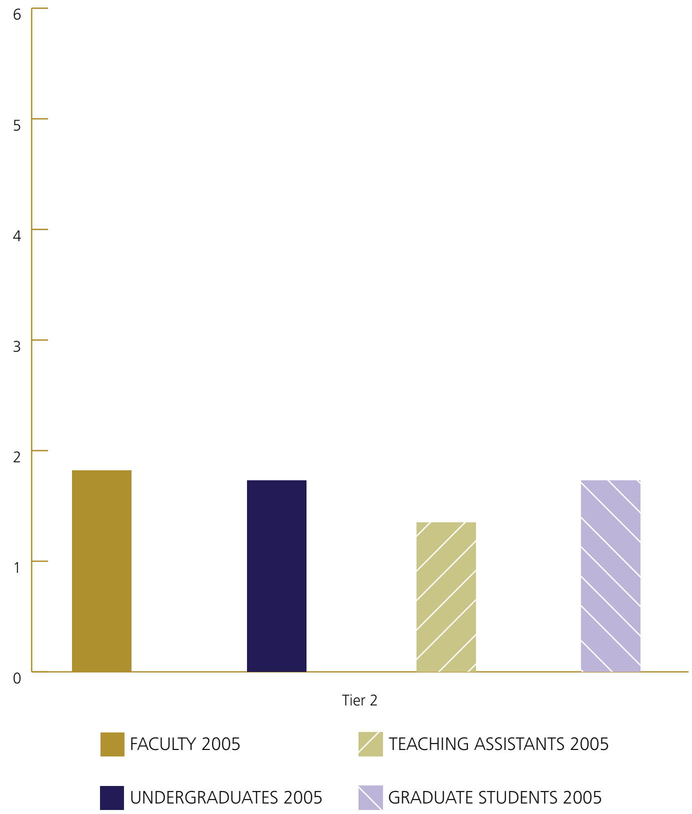
TIER 1 TECHNOLOGY USE

FIGURE 29



TIER 2 TECHNOLOGY USE

FIGURE 30



Perspectives on Technology

Earlier in this report, we presented the technological goals that received the most support from undergraduates and faculty. Undergraduates felt that "the UW should" require course Web sites. Faculty wanted more opportunities to use technology to support their instruction; in particular they wanted better access to technology in classrooms. In this section, we present the goal that received the most support from both teaching assistants and graduate students. We also discuss graduate students and teaching assistants' opinions on the issues championed by their undergraduate and faculty counterparts.

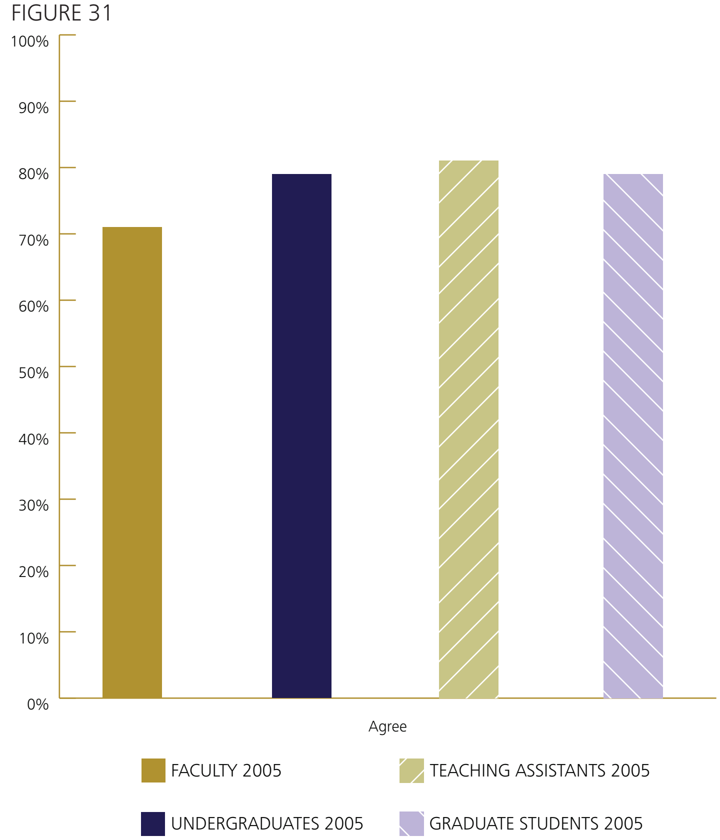
Required Technologies

According to graduate students and teaching assistants, the first technological goal that the UW should pursue is to inform students of the technologies that are required in their courses. FIGURE 31 compares agreement with this statement across populations. In FIGURE 31, the percentage that agree represent the combined total of those that marked agree somewhat or agree strongly.

This item received more support from graduate students and teaching assistants than any of the other goals listed. Although it did not occupy the top spot for undergraduates and faculty members, it did receive strong support from these groups. Therefore, graduate students and teaching assistants were not unique in desiring this type of information be shared, but were unique in this being their top concern.

INFORMATION ON REQUIRED TECHNOLOGIES

FIGURE 31

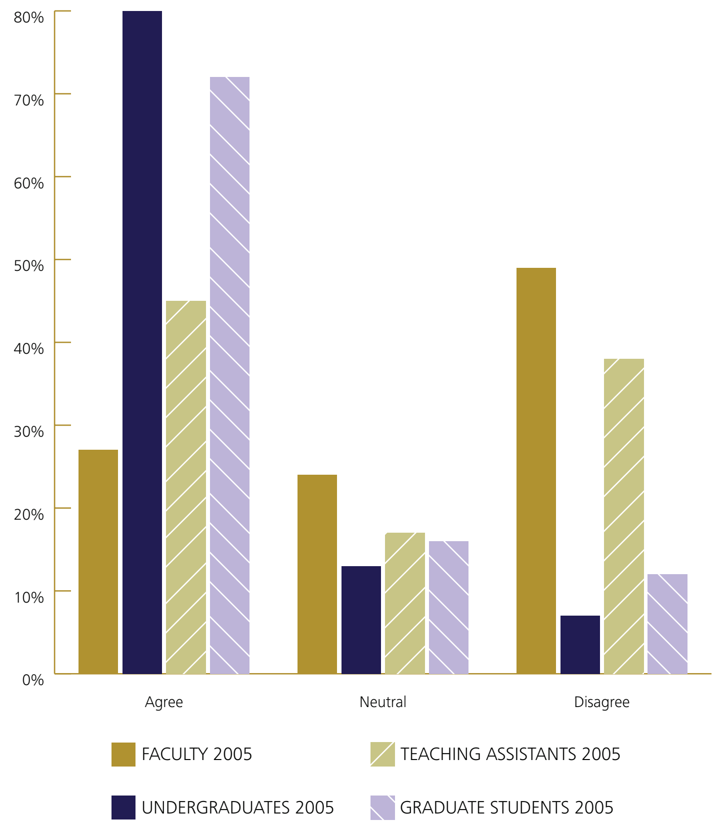


Online Resources

For undergraduates, required course Web sites were the top priority. FIGURE 32 compares levels of agreement with this goal across populations. Once again, we have simplified the scale to facilitate the easy identification of patterns across groups. The numbers for agree include responses from agree somewhat and agree strongly: for disagree, they include disagree somewhat and disagree strongly.

The responses from graduate students and teaching assistants fall between those of undergraduates and faculty—a frequent pattern within study data. More significantly, there was substantial difference between graduate students and teaching assistants on this issue. Teaching assistants aligned more closely with faculty than they did with graduate or undergraduate students. Even so, they still tended to favor course Web sites—more agreed than expressed neutrality or disagreement—unlike their faculty counterparts.

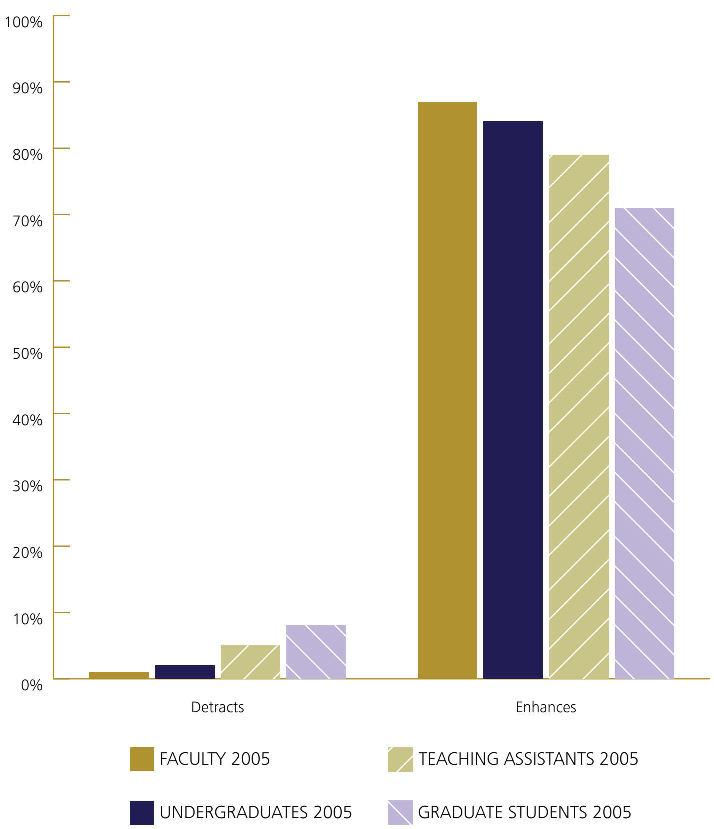
REQUIRE COURSE WEB SITES
FIGURE 32



Classroom Infrastructure

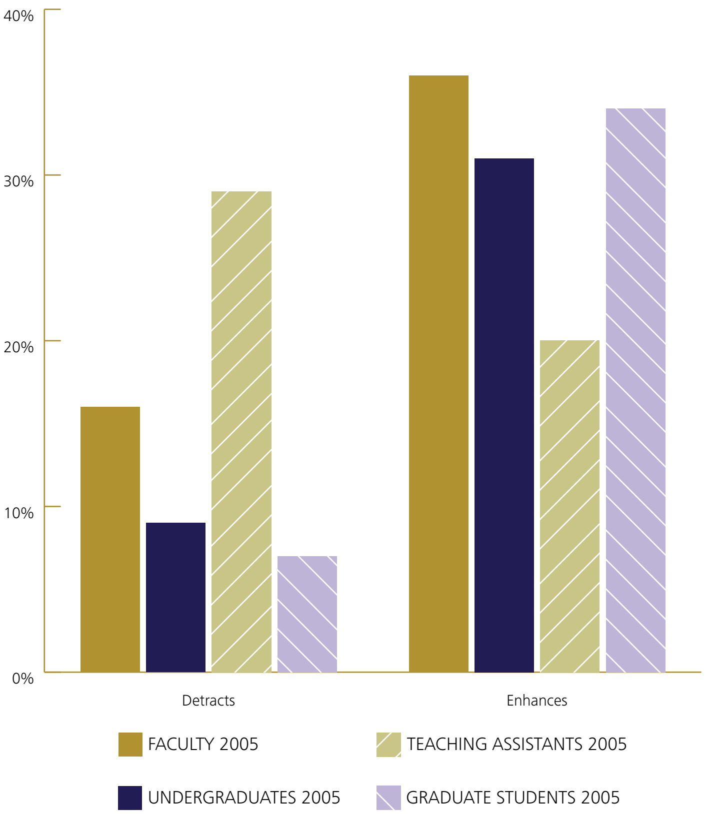
Faculty members believed that the UW should provide more opportunities to use technology for instruction: 73% of faculty respondents expressed some level of agreement with this goal. Teaching assistants also supported this goal, but with somewhat less enthusiasm: 60% expressed some level of agreement. For faculty, one of the main means by which the University could meet this goal was by improving access to technology in classrooms. On the surveys, we asked instructors and students to indicate whether particular technologies enhanced or detracted from their instruction/learning. Both faculty and undergraduates agreed that a computer with projection was an enhancement. FIGURE 33 shows teaching assistant and graduate students' responses, alongside those of undergraduates and faculty. To simplify the comparison, we show percentages of responses for detracts and enhances, but not for neutral or no experience.

COMPUTER WITH PROJECTION
FIGURE 33



While both graduate students and teaching assistants saw a computer with projection as an enhancement to the seminar classroom, they did not rank it as highly as undergraduates and faculty did. In particular only 71% of graduate students saw this technology as an aid to learning, as opposed to 84% of undergraduates. Teaching assistants showed strong interest, with 79% seeing this technology as an enhancement, but this was not the case with many of the other items listed. In particular, teaching assistants did not see student-centered technologies, such as laptop computers for student work, as an enhancement. FIGURE 34 compares responses to this item across all four population groups.

LAPTOPS FOR STUDENTS
FIGURE 34



Teaching assistants were the only population that marked any of the technology options for seminar classrooms as more likely to detract than enhance instruction. Four items received marks from teaching assistants under detracts that were the same or higher than those under enhances: Ethernet access for students' laptops, wireless access for students' laptops, a desktop workstation for each student, and a laptop computer for each student. All four items had a student focus. Looking across all study populations, the majority in each group tended to be neutral on these technologies. However, this does not account for the fact that more teaching assistants' saw these particular technologies as detracting from educational activities than saw them as an enhancement—a pattern that appeared in no other group's responses. These figures reinforce patterns discussed earlier in this report. Teaching assistants are not only using fewer technologies for their instruction, but they are also more likely to see these technologies as undesirable.

There are several reasons that teaching assistants could be less inclined to use technology: the types of responsibilities they have in many courses, a lack of decision-making power over curriculum, limited class preparation time (teaching assistants get course assignments with less advance notice than faculty), and less access to equipped rooms (this was apparent in responses to questions about technology classrooms).

While these elements were discussed briefly in some focus groups, we did not have sessions that focused directly on issues facing teaching assistants, so many of these possibilities are speculative. What is clear from the data we did collect is that teaching assistants have different patterns of technology use than their faculty counterparts. Rather than being more prolific in their use of technology, as their age and expertise level would suggest as likely, they are less so.

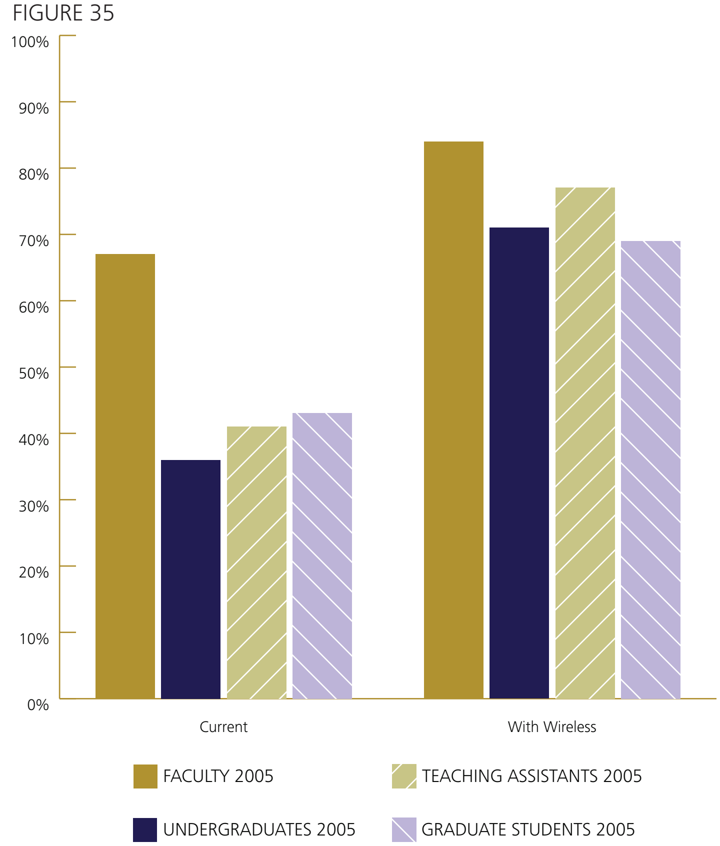
Emerging Technologies

Laptops and Wireless

In a comparison of data on emerging technologies, graduate students and teaching assistants' responses tended to align with undergraduates in some cases and with faculty in others. Both graduate students and teaching assistants owned laptops at rates similar to faculty: 78% of graduate students were laptop owners, as were 79% of teaching assistants and 79% of faculty members.

Although a very high percentage of graduate students and teaching assistants owned laptops, the frequency with which they brought them to class was more similar to undergraduates than it was to faculty members. FIGURE 35 compares the percentage within each group that currently brings a laptop to class with the percentage of respondents in each group would bring a laptop to class if wireless were available. In this scenario, teaching assistants tended to fall between faculty and undergraduates. Graduate students were slightly less likely than the other groups to bring a laptop to class. With all four

CLASSROOM USE OF LAPTOPS
FIGURE 35

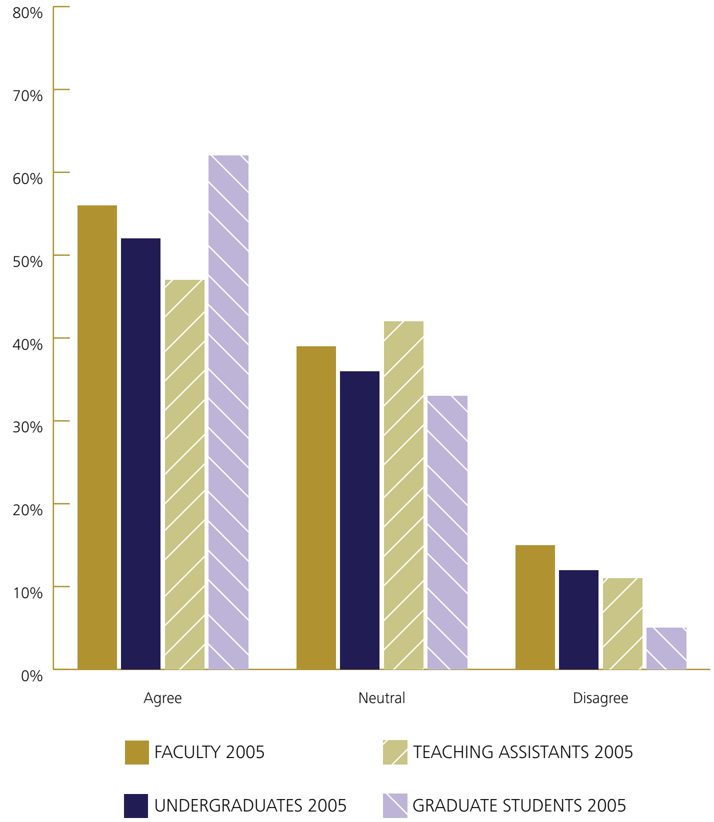


groups, however, responses indicate that laptops in class are likely to increase with wireless in the classroom.

Web-based Tools

An interesting difference appears between graduate students and teaching assistants on questions about online portfolios. FIGURE 36 shows responses to a goal statement about supporting online portfolio use by students. Interestingly, graduate students endorsed this goal more strongly than any of the other groups did. Conversely, teaching assistants expressed the lowest level of support for this goal. This pattern corresponds with trends discussed earlier in this report; in particular, the response to the question about online portfolios once again demonstrates that teaching assistants find the use of technology less desirable than other groups do. On the other hand, the level of interest in online portfolios expressed by graduate students suggests that members of this group would benefit from a targeted effort to provide them with training and support in this area.

SUPPORT ELECTRONIC PORTFOLIOS
FIGURE 36



Laptops, wireless, and online portfolios were the emerging technologies where graduate student and teaching assistants' responses revealed patterns that added new dimensions to elements discussed in the section on undergraduates and faculty members. In the interest of saving space and minimizing repetition we have streamlined some of our coverage of graduate students and teaching assistants, but what we have presented here demonstrates that these two populations have unique responses and needs that require strategies targeted to these groups.

CONCLUSIONS AND RECOMMENDATIONS

OVERVIEW

In this section, we summarize the primary conclusions presented in the results section. For each conclusion, we provide a list of recommended actions for the University community to consider. We end with a discussion of the future of this project.

CONCLUSIONS

The list of conclusions presented below consolidates the dominant trends in the survey and focus group data. We present the list in an order that matches the discussion of these items in previous sections of this report, rather than in order of significance.

- Differences in gender and age influence technological expertise ratings and technology use patterns; most significantly, men rate their expertise with and use of technology higher than women do.
- Faculty members use a higher number of established technologies for academic purposes than undergraduates do; undergraduates use a higher number of emerging technologies for academic purposes than faculty do.
- Support for general-access technology facilities and services is high among both instructors and students.
- Undergraduate students want more course materials available online.
- Faculty members want more opportunities to use technology to support their instruction. In particular, they want better access to technology in classrooms.

- The addition of wireless access in classrooms is likely to have a substantial impact on how many instructors and students bring laptop computers to class.
- Interest in Web-based tools, such as electronic portfolios and online discussion boards, is high.
- Teaching assistants and graduate students that do not teach not only differ from each other in their experiences with and perspectives on educational technology, but they also differ from faculty members and undergraduate students—making their division across the two survey instruments problematic.
- Teaching assistants exhibit less interest in academic technologies than faculty members, graduate students, or undergraduate students do.

RECOMMENDATIONS

Approach

We designed the study to take a broad perspective, capturing general campus trends, rather than looking at a few issues in depth. For this reason, many of our recommendations are quite general. At times we call for the further investigation of an issue. Such inquiries could be carried out by a variety of University groups: the collaborative partnership that created this survey or a few of its constituents, other University units with an interest in educational technology, and/or current or future committees charged with making decisions in these areas. In the next few pages, we provide specific recommendations for each of the conclusions listed earlier.

Demographic Influences

- Differences in gender and age influence technological expertise ratings and technology use patterns; most significantly, men rate their expertise with and use of technology higher than women do.

We recommend further investigation to assess actual technology skills, rather than self-reported expertise. Within our study, the consistency of data in these areas leads us to recommend that the University community be aware of how gender and age may influence certain technology skills.

Technology Use

- Faculty members use a higher number of established technologies for academic purposes than undergraduates do; undergraduates use a higher number of emerging technologies for academic purposes than faculty do.

We recommend further investigation to better understand how students are beginning to use new technologies for academic purposes. This investigation could be formal or informal, from focus groups with students to community discussion forums. The research team also plans to revise future surveys so that emerging technologies are included in technology expertise assessment questions (in the 2005 surveys expertise questions focused solely on established technologies).

University Technology Facilities and Services

- Support for general-access technology facilities and services is high among both instructors and students.

The research team does not recommend changes in this area, since support is strong for general-access technology facilities and service. The continued success of these facilities and services plays a role in the recommendations we make in other areas.

Online Resources

- Undergraduate students want more course materials available online.

We recommend further investigation to identify the obstacles to putting materials online and to provide more information about the reasons behind faculty resistance on this issue. Several members of our team—including the Office of Learning Technologies, Computing & Communications, and Educational Outreach—have started working together to find ways to streamline the existing online publishing process and help faculty put materials online.

In addition, new developments from the Catalyst group, within the Office of Learning Technologies, may make it easier for faculty share course materials with their students online. The Catalyst group recently introduced a new Web-based tool, ShareSpaces, for University students. This tool provides an online space for student groups to share files; the Student Technology Fee Committee funded its development. The Catalyst group is working with Computing & Communications to release a version of this tool to faculty. When the tool becomes available for faculty use, it will provide a new option for sharing course materials with students.

Classroom Technologies

- Faculty members want more opportunities to use technology to support their instruction. In particular, they want better access to technology in classrooms.

We strongly recommend that the University make a commitment to improving technology in classrooms. Further investigation is needed to identify the specific changes that would enhance University classrooms. Since our study did not ask many direct questions about classrooms, our understanding of this issue comes from unprompted comments made during focus groups and in the general comments at the end of the surveys. While the qualitative data indicate a strong need for improvement in this area, further focused investigation is needed to develop a comprehensive plan of action.

Wireless

- The addition of wireless access in classrooms is likely to have a substantial impact on how many instructors and students bring laptop computers to class.

This issue requires additional observation of patterns over time to see if the trends predicted in the data hold true once wireless is available in more places on the Seattle campus. We will investigate this issue further on future iterations of the educational technology surveys. In the meantime, the mixed opinions on this issue—the new opportunities for learning that this technology affords along with its potential to disrupt classes—requires additional discussion within the University community.

We recommend that a larger discussion of the issues surrounding wireless access in classrooms should take place as the implementation of this technology progresses. The University community stands to benefit from discussion forums, presentations, and/or workshops on this issue. In the forums mentioned above, or in other venues, it is important to present useful models of the pedagogical options that this technology affords. Some of these options, such as group work and activities outside the classroom, were discussed in focus groups, as was the need for practical models for using this technology.

Web-based Tools

- Interest in Web-based tools, such as electronic portfolios and online discussion boards, is high.

We recommend increasing the education and outreach efforts for Web-based tools. The Catalyst group is using the results of this study, along with findings from other research efforts, to help shape its support, development, and marketing plans. In addition to working on the educational technology surveys and focus groups, researchers from Catalyst group are also working with the National Coalition of Electronic Portfolio Research to investigate the use of electronic portfolios in higher education. In spring 2005, researchers interviewed several students that had entered the Catalyst Portfolio Contest. Findings from this study informed a redesign of the portfolio assignment in the Freshman Interest Group (FIG) program and are currently being used to inform a pilot project in the English department. Findings are available online at http://catalyst.washington.edu/projects/.

Graduate Students/Teaching Assistants

- Teaching assistants and graduate students that do not teach not only differ from each other in their experiences with and perspectives on educational technology, but they also differ from faculty members and undergraduate students—making the division of graduate students across the two survey instruments problematic.

We plan to make changes to the next iteration of the educational technology surveys. Instead of dividing graduate students between the instructor and student surveys, we will look at graduate students separately, with some questions for all graduate students and others targeted towards teaching assistants or graduate students that do not teach. We also recommend that the larger university community look closely at these groups when studying our institution, in order to ensure that their needs and desires are adequately represented.

Teaching Assistants and Technology Use

- Teaching assistants exhibit less interest in academic technologies than faculty members, undergraduate students, or other graduate students do.

We recommend further investigation to identify and overcome obstacles that get in the way of technology use by teaching assistants. We also recommend that the University provide more training and resources for teaching assistants to use technology. The research team plans to conduct focus groups with teaching assistants to better understand their needs. We will schedule these focus groups before we design the next survey.

Next Steps

One objective of the surveys and focus groups was to gather information that would help guide the future direction of educational technology at the University of Washington. As a first step towards the realization of this goal, the collaborating partners are using study data to help guide their future work. For instance, The Office of Learning Technologies and Computing & Communications are exploring ways to simplify the process of putting resources online. Additionally, the Catalyst group, in the Office of Learning Technologies, is using survey data to help shape future tool development efforts. The research partners hope that other University constituents will consider findings from this report as they make decisions involving educational technology.

Before we conclude this report, there is one more issue that requires attention. One respondent to the faculty survey voiced an important concern about the design of this study; this faculty member felt that the survey was biased because it was created and distributed by groups that were directly or indirectly involved with campus technology. While the partners involved in this project are actively involved in supporting educational technologies at the University, we believe that this involvement is a benefit to this project because we are in a position to directly respond to study results. The survey and focus group data allow us to better understand the needs and the desires of the community we serve. Even though many of us are technology advocates, the promotion of more technology use is not our ultimate goal. Our groups work to help instructors and students use technology in ways that serve the larger mission of our university—to support teaching and learning. The surveys and focus groups are tools for expanding our awareness of the educational component of educational technology.

Technology on its own has very little innate ability to impact teaching and learning; its capacity to support or undermine educational activities is realized by the manner in which it is employed. This sentiment was voiced by several study participants. A student in one of the focus groups observed the following:

> *What I have noticed about instructors using technology in class is that often it is simply being used for the sake of using technology. Good teaching is still about being a good teacher, engaging your students, and using the most appropriate tool for the job.*

This student's comments are a strong reminder of what is at stake in conversations about educational technology; the first word in the term—educational—is the one that needs emphasis.

While voicing concerns about non-educational uses of technology, students and instructors also commented on why technology is an effective tool for supporting education. The first quote comes from a student and the second from a faculty member.

> *The UW should make a policy that encourages instructors to use technology, not for the bells-and-whistles sake of being novel, but as a superior mode for lecture and instruction compared to what we have known in the past.*

> *I think students nowadays are so in tune to technology. So, I think if we give them something they are very familiar with, they can use it more and they can learn more from it.*

This report does not aim to promote the use of technology for its own sake, but rather to promote the use of technology in a manner that benefits teaching and learning at the University of Washington.

The research team plans to repeat this study every three years. The next iteration of the study, in 2008, will allow us to track the changing role of technology at the University. In the meantime, we will be involved in other research endeavors. In 2006, the EDUCAUSE Center for Applied Research (ECAR) will survey University of Washington students about their technology use as part of a nationwide study. Researchers in the Office of Learning Technologies will compare ECAR results with results from the 2005 surveys and focus groups and share their observations with the University community. The research team also intends to follow up on some of the trends identified within this study.