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But are they Connected?: A Report on the Queens College Technology Survey of the Use of Ubiquitous Tools for Learning

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Introduction

A great deal of attention has been focused on the current generation of college students, who have been referred to since the first decade of the 21st century as the "Net Generation" (Tapscott, 2000) or as "Digital Natives" (Prensky, 2001). According to Tapscott (2000), given the digital tools they need and expect, the students of this generation will be a "revolutionary force" for educational change (2001, Chapter 7, "Truism" 3: paragraph 7). Prensky defined "digital natives" as the first generation to have spent their lives "surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (2001, p.1). In describing their learning preferences, Prensky goes on to say:

> Digital Natives are used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics before their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to "serious" work. (2001, p. 3)

According to Prensky, those charged with teaching this generation of students must assume that "today's learners are different" (p. 3).

Observations like these were big news about a decade ago, at the start of the 21st century. Technology promised to change learning and, according to Prensky and others (Tapscott, 2001; Oblinger & Oblinger, 2005), was changing learners as well. Bennett, Maton, and Kervin, (2008) refer to the digital natives debate and the accompanying arguments about the need to overhaul curricula and pedagogy as the "academic equivalent of a moral panic" (p. 776), with little empirical evidence in support of these claims. Many digital natives are engaged in multitasking behaviors using an array of digital tools and, indeed, the research on the impact of multitasking on memory and learning is not positive (Edwards & Gronlund, 1998; Fischer, Morrin, & Joslyn, 2003; Judd & Kennedy, 2011; Rubinstein, Meyer, & Evans, 2001; Sweller, 1988). But digital natives are not the only ones who multitask and, arguably, technology offers opportunities that require reshaping how we attend to information, how we collaborate, and how we build learning environments (Davidson, 2011).

Hoping to better understand digital natives and their learning preferences, the EDUCAUSE Center for Applied Research (ECAR) began conducting a nation-wide survey of undergraduate students in 2004, sampling from colleges and universities around the United States. Using a survey coupled with focused interviews, the study explored student experiences with technology as well as technology skill levels and patterns of use (Kvavik, Caruso, & Morgan, 2004). Convenience was a prevalent factor in positive perceptions of technology as a learning tool, as well as students' improved abilities to communicate with their instructors. Subsequent ECAR surveys included similar questions about ownership, skills, and patterns of use, while adding questions meant to challenge commonly held assumptions about digital natives (Caruso & Kvavik, 2005). One of the recurring findings in the ECAR surveys has been that high proportions of students surveyed own computers (93% in the 2010 survey, for instance), but nonetheless most students prefer a moderate use of technology in their courses.

This preference for moderate use by Digital Natives has prompted a call by some researchers for more contextualized research that looks at why most college students don't match the Digital Native or Net Generation profile. Lohnes and Kinzer (2007) noted that much of the research data collected in this area comes from surveys and questionnaires, which indicate how college students are using technology but don't address why they use it or don't use it. After conducting an ethnographic study with a group of liberal arts undergraduates, Lohnes and Kinzer reported students' dorm room digital personas matched commonly held assumptions of the Net Gen or Digital Native student. Their classroom learning personas, however, were much more traditional in their teaching and learning preferences and in identifying the role that technology plays in their academic lives.

In this paper we document the technology profile of students at Queens College, a primarily undergraduate public institution, part of the City University of New York. The growing number of technology initiatives at Queens College motivated us to take a closer look at what was happening on our own campus. According to Gibbons (2007), ECAR findings on a national level are important for informing academic and policy decision makers in higher education, stating "in order to be truly student-centered, we must be cognizant of the high level student trends, but truly fluent in the local campus trends" (Gibbons, p. 2). For this initial investigation, we designed a survey that would offer us primarily quantitative data, but also some qualitative comments; the combined dataset offers insights that are providing the baseline we can use to begin to contextualize the findings in future investigations that might be more qualitative in nature.

The Queens College Landscape

Queens College is one of 26 campuses in the City University of New York. The institution is home to approximately 15,000 undergraduate and 5,000 graduate students. In the undergraduate student body, some 73% of students attend the college full-time, and 60% are women (Queens College Fact Book, 2011). As a large urban public situated in a highly multilingual and multicultural part of New York City, Queens College attracts a range of non-traditional undergraduate students: they come from 150 different countries and report fluency in 66 different languages; 38% of them are first-generation college students; 28% are of Asian background, 17% are Hispanic, 8% are black (Queens College Fact Book, 2011); 38% live in households where the annual income is below $30,000; 90% live with parents or other family members (CUNY Office of Institutional Research and Assessment, 2010). The college's liberal arts degrees for undergraduates expose students to a broad variety of disciplines, particularly through general education requirements, but the disciplines attracting the largest number of majors are pre-professional areas of study: Accounting, Psychology, Sociology, Economics, and teacher certification programs in Elementary and Secondary Education. This emphasis on the part of the students' choices of areas of study that are more pre-professional rather than strictly liberal arts reflects nation-wide trends in higher education (Brint, Riddle, Turk-Bicakci, Levy, 2005).

Students in all kinds of higher education environments can benefit from technology infused instruction. At Queens College, the use of technology is embraced by an important sector of the faculty, but is not universal. Given our non-traditional undergraduate population, there is concern among some faculty and administrators that our students' access to technology will be limited. These concerns are sometimes used to justify the continued support of laboratory spaces for students, but can also be used to advocate for minimizing technology in ordinary instruction.

Despite such resistance, there is a growing interest campus-wide in using technology for teaching and learning. Initiatives launched by our Center for Teaching & Learning (http://www.qc.cuny.edu/ctl) have promoted the use of electronic portfolios, hybrid and online delivery of instruction, blogging, lecture capturing and web broadcasting, and the use of electronic resources and e-books. The Center promotes technology-mediated teaching as a way to engage faculty and students in teaching and learning, on grounds that engagement leads to deeper learning for the students and a greater sense of satisfaction for the instructors (Iiyoshi & Kumar, 2008; Means, Toyama, Murphy, Bakia, & Jones, 2009; Nelson Laird & Kuh, 2004). We are also aware that the use of technology for teaching and learning has additional direct benefits for students: it boosts information literacy and exposes students to discipline-specific tools (Bransford, Brown, & Cocking, 2000; Gee, 2003; Greenhow, Robelia, & Hughes, 2009; Jonassen & Reeves, 1996; Leu, Kinzer, Coiro, & Cammack, 2004).

Promoting technology-mediated and technology-infused teaching, however, is not advisable without background knowledge about the perceptions that students have of technology in their personal and academic lives or the experiences they have had with technology for teaching and learning. Indeed, "efficient and effective innovation" is possible "only through understanding what tools our students are bringing with them and how they are using these tools to navigate their own educational experiences" (ECAR, 2010, p. 26). Our primary objective in surveying our students was, therefore, to acquire information that would help us design better learning environments and offer better faculty development. Existing sources of data were not sufficient. National surveys (such as the one conducted annually by ECAR) might arguably not be comparable, given the non-traditional status of our students. Existing local surveys were inadequate in both breadth and depth (a college alumni survey, administered annually, includes only two questions about technology; a university-wide student experience survey includes 16 questions which focus on practices, but not preferences or perceptions). This dearth of information about students' perceptions of technology could be supplemented by surveying our students. In the next four sections we describe the design and procedure of two administered surveys, and we present some of the results.

Survey Design and Procedure

The data reported below come from two surveys administered in two consecutive spring semesters: 2010 and 2011. The surveys were constructed in consultation with members of the faculty and administrative staff; the latter group included representatives from institutional research, institutional technology, communications, and educational technology. A preliminary version of the survey was piloted during December 2009 with 65 respondents whose answers helped to fine-tune the 2010 instrument. The complete text of both surveys is available on request from the authors.

A number of the questions were formulated based on questions appearing in the ECAR 2009 survey (Smith, Salaway, Caruso, and R. Katz, 2009), and were included to permit informal comparisons of our local dataset with national statistics. A substantial portion of the two surveys consisted of questions created for our local needs, driven by an interest in examining a number of campus-specific issues, including email communication preferences and use of laptops and other portable technologies at various facilities around the college.

Both surveys asked basic questions about the participants' background, including: age, sex, household type, commute time to campus, employment, and area of study and class standing. Both surveys also asked about access and personal preferences, including questions about: ownership of equipment (including personal computers and other technologies), access to the Internet, email communication preferences, use of general categories of software, social networking and video-gaming habits, technology adoption profile and preferences, and learning style preferences.

In addition, both surveys asked students to rate the extent to which tools for technology-enhanced teaching and learning (including learning management systems, electronic portfolios, social networking tools, etc.) enriched their learning experience, facilitated their communication with peers or their instructors, and proved to be convenient. Both surveys also included questions about online and partially online ("hybrid") learning experiences and preferences. Response patterns for these two question types will not be reported below.

Both surveys included an optional open-ended question at the end, for any additional comments. Over 400 (24%, 2010) and 270 (39%, 2011) participants offered opinion comments, which fell into two overarching categories: technical issues, teaching and learning issues. The majority of the comments involved technical issues (67% 2010, 58% 2011), such as accessing the Internet on campus, hardware and software on campus, the course management system Blackboard, the college website, the college email system, and the university student registration system. The set of comments more pertinent to the objectives of this investigation addressed teaching and learning issues (33% 2010, 42% 2011), and these comments expressed opinions about learning preferences, extent of use of technology, amounts of online or hybrid course offerings, and faculty use of technology for teaching. In the sections that follow, we occasionally draw from this corpus of comments (indicating for each the sex and age range of the respondent, as well as self-reported technology preferences), to illustrate some of the arguments inferred from the quantitative data.

The 2010 and 2011 surveys differ in minor ways, which do not affect the central findings of this report. The 2010 survey included questions about ebook readers, which have been reported elsewhere (Foasberg, 2011). The 2011 survey eliminated or simplified questions about email communication preferences and included more detailed questions about use of laptops in classrooms, about computer ownership, and about perceptions of faculty use of technology.

The surveys, administered entirely online using the web-survey system Survey Monkey, were advertised using standard channels for communication at the college. All students enrolled during those spring semesters received up to three emails about the survey; announcements were posted around campus; student leaders were asked to disseminate the information to their peers; electronic announcements were made on the college website, in the college learning management system landing page, and in a number of Facebook pages associated with the college. The spring 2010 survey involved a raffle; the spring 2011 survey did not.

The 2010 survey was open for a total of 2 months; 2,505 students started the survey, 1,701 completed it (68% completion rate). The 2011 survey was open for a total of 5 months; 1,303 students started the survey, 692 completed it (53% completion rate). In the discussion below, we sometimes present data from only one of the surveys; in such

cases, either the questions were not asked in the survey not cited, or the data patterns for the two years were identical.

The demographics of our two samples are very similar to demographics for the college's student population in terms of sex, age distribution, class standing, and area of study (affiliation with one of the four academic divisions). The 2010 sample represents 8% of the 20,700 registered students that semester; the 2011 sample represents approximately 3% of the 20,541 registered students that semester.

Equipment and Access

A set of related questions asked about our respondents' access to laptop or desktop computers at home; these data are presented in Table 1. These estimates strongly resemble data reported in the 2010 ECAR survey, whose respondents reported owning either a laptop or a desktop at a rate of 98%. In our samples, ownership of a desktop or a laptop is universal, and computer models that are less than five years old (five years is the replacement cycle for faculty and laboratory computers on our campus) are clearly the norm. In the 2011 survey, we additionally asked respondents to indicate whether they were the primary users of equipment available at home. For the 2011 sample, 67% of respondents with access to desktops and 85% of respondents with access to laptops reported being the primary users.

Table 1. Access to computers at home.

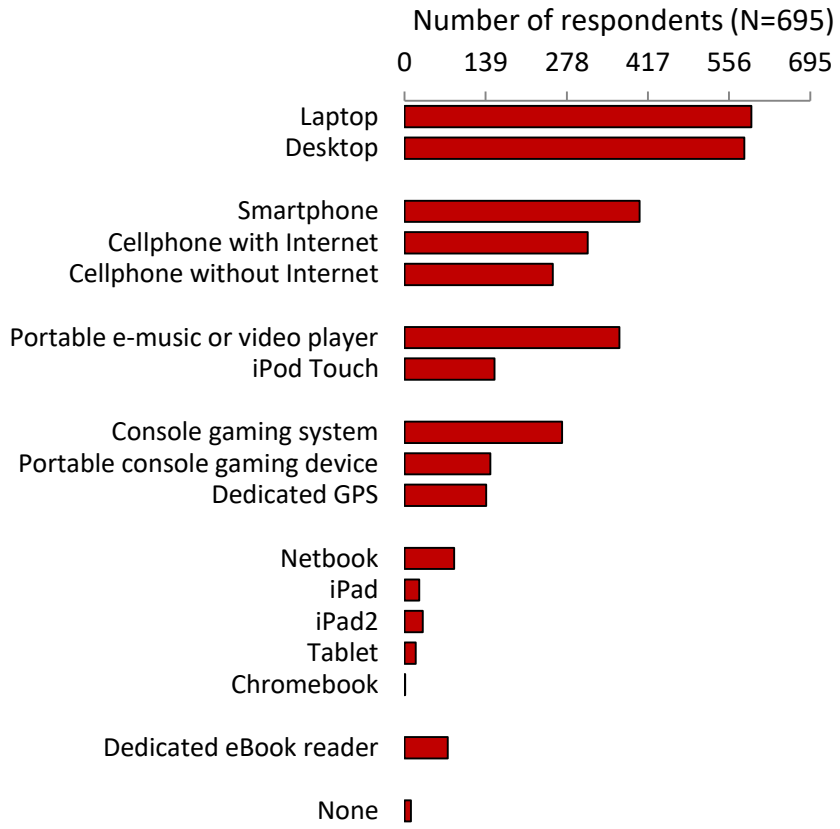
	2010 (N=1,705)	2011 (N=695)
Either laptop or desktop	99%	99%[1]
Both laptop and desktop	57%	70%
Laptop < 1 year old	27%	24%
< 2 years old	60%	67%
< 5 years old	82%	95%

[1] 11% of these were reported to be Tablet PCs

Respondents were asked to indicate technologies owned, in addition to a personal computer. These findings are reported in Figure 1, for the 2011 sample (data for 2010 are similar, though rates of smartphone ownership were slightly lower). The figure suggests that small portable electronics are ubiquitously available in this population, with almost 100% of the sample owning cellphones with or without Internet access, over half owning portable electronic music players, and close to half owning a gaming system of some sort. Similar patterns were noted nationally by ECAR (S. Smith et al., 2010) as well as the Pew Internet and American Life survey on Americans and their gadgets (A. Smith, 2010).

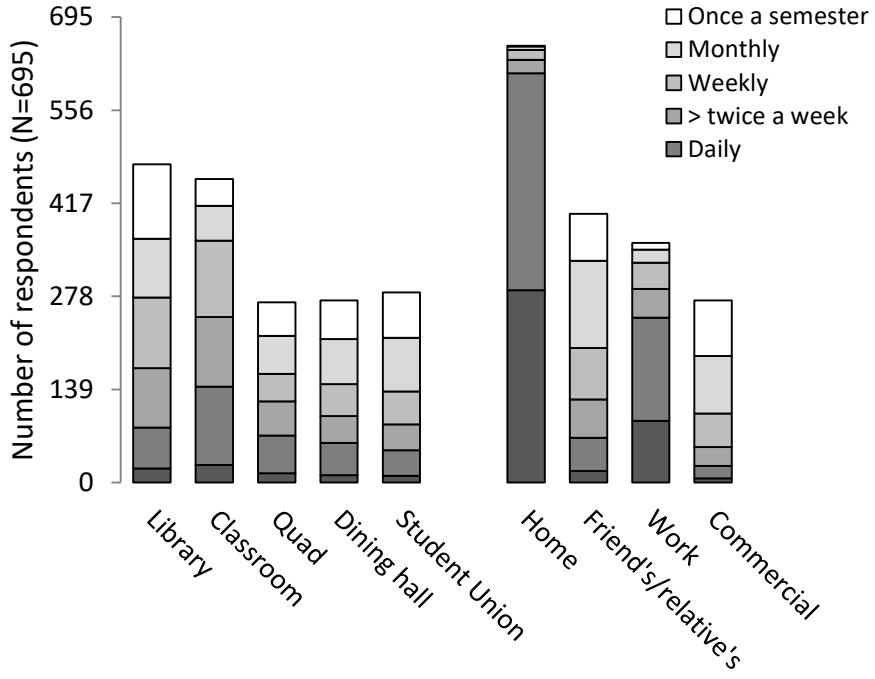
Ownership of dedicated ebook readers is relatively low (for details and some discussion of the underlying reasons for this trend, see Foasberg, 2011).

Figure 1. Ownership of technological devices; 2011 sample.



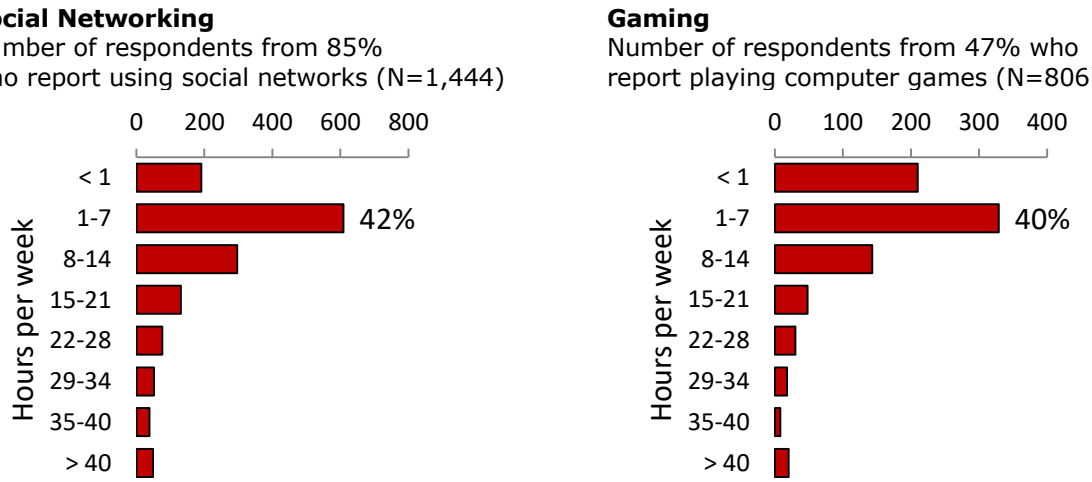
In both samples, we find that over 90% of respondents have high-speed Internet access at home, with an important portion of the remaining respondents reporting uncertainty about their access, access through mobile broadband, or wireless access. An insignificant proportion (less than 2%) reports having dial-up access or no access. It is from home where our survey respondents are predominantly accessing the Internet, according to data reported in Figure 2, which shows that close to 100% of respondents access the Internet daily from home, well over a third of them spending over five hours per day online.

Figure 2. Access to the Internet on campus (left panel) and elsewhere (right panel); 2011 sample.



One final aspect of our respondents' hyper-connected lives comes from questions about the amount of time they spend on social network sites or playing computer games; responses to these questions are reported in Figure 3. For the 2010 sample (whose patterns are almost identical to the 2011 sample), well over two thirds are regular users of social network sites (Facebook being the network of choice for nearly all of them), and close to one half are regular gamers (puzzle games being the most popular).

Figure 3. Hours per week spent social networking or gaming; 2010 sample (N=1,705).



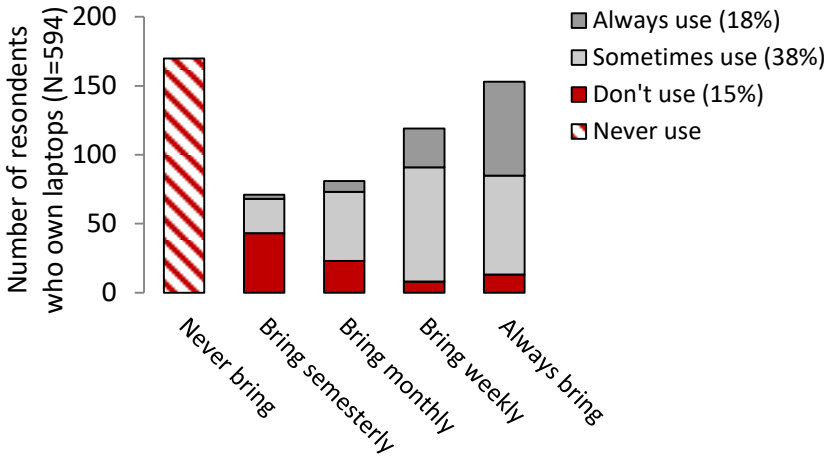
The obvious conclusion that emerges from this overview of the respondents' equipment and access to technology is that our students are well equipped and have ubiquitous access to a range of sophisticated and powerful technologies. But to what extent does their technology infiltrate their academic lives? We turn to this question in the next section.

Technology for Academic Purposes

We pointed out earlier that students whose personal lives are immersed in sophisticated tools might have good insights about how to exploit these in academic settings. A number of the questions in our surveys explored how students use laptops, software, and the Internet, specifically in connection to their experiences at the college.

The use of laptops in class is anecdotally low around campus, so our 2011 survey included a number of questions designed to explore the reasons why students who own laptops do not bring or do not use their portable computers; these data are displayed in Figure 4. Of the 594 students who reported owning laptops, close to a third (red striped bar in Figure 4) indicated they never bring their laptops to campus. The top reasons respondents cited for leaving their laptops at home include the weight of the machine, concern about theft, concern about distraction, and no access to power. Approximately 15% of laptop owners report bringing their laptops to campus but not using them (red solid bars in Figure 4), citing among the top reasons distraction, no access to power, no-laptop policies in class, and unreliable access to the Internet. Both laptop bringers and non-bringers frequently indicated that they simply "don't want to" bring their equipment to school. Some of the written comments provided with this question indicate that taking notes by hand is perceived to be more convenient.

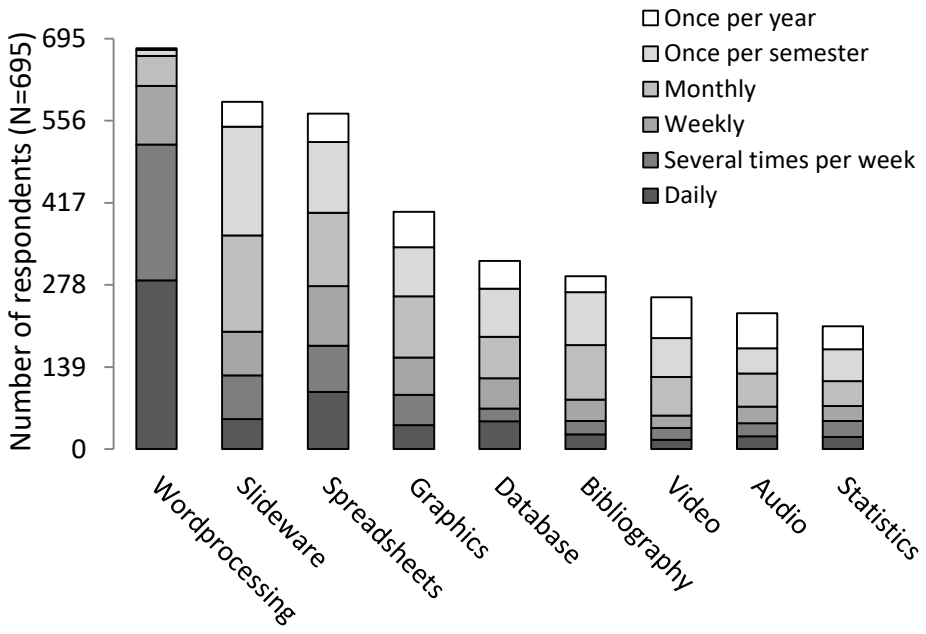
Figure 4. Laptops brought to or used in class by respondents who own laptops (N=594); 2011 sample.



Students who do bring their portable computers to class (gray solid bars in Figure 4, 56% of laptop owners) overwhelmingly indicate they use their machines to take notes (89%) and to search for information related to class topics (82%); some report using their laptops to chat with classmates about the course (27%). But a substantial number report using their laptops to engage in behaviors that their instructors might frown upon: emailing (72%) or social networking (42%). A range of other non-academic behaviors are reported (each by less than 10% of the laptop bringers): tweet about class or about topics other than class, play games or watch videos (particularly, as adeptly explained by one respondent, "if the lecture is boring"), do coursework, check Blackboard, access e-readings, read news, register for classes. Only two respondents (0.6%) indicate using their laptops with assistive purposes: to record lectures or use translation software.

Another set of questions around academic uses of technology asked students to indicate their academic use of a range of software-based tools, including officeware (word processors, spreadsheets, slideware/presentation tools), database software, graphics and video/audio editing software, bibliographical reference software, and statistics software. These trends are reported in Figure 5, which shows that students use word processing software on a daily basis, but use all other software categories with relatively less frequency. Explorations of the responses to these questions based on discipline indicate few differences in the use of spreadsheets or statistics software, say, between students majoring in sciences or in the humanities: neither group has a high proportion of daily users of these tools. Also noteworthy is the dearth of use of tools for bibliographical references.

Figure 5. Use of software tools for academic purposes; 2011 sample.

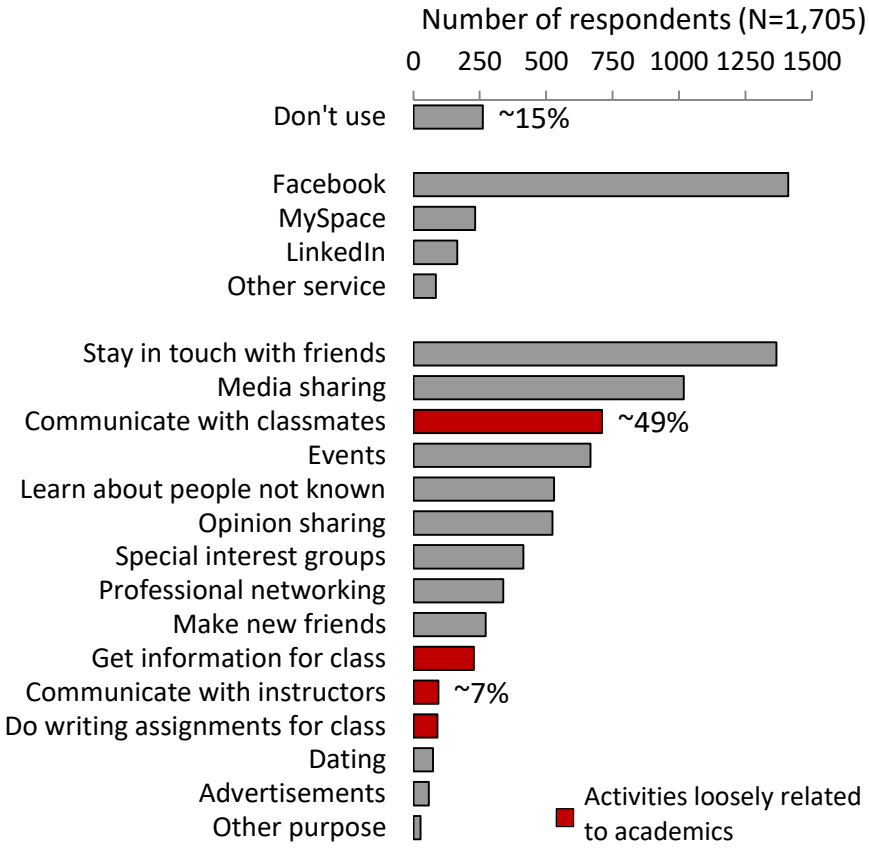


We have anecdotal evidence that some of our students would welcome more social networking in their academic experiences at the college, and not just for socializing. Here is how one of the respondents put it, in the open-ended comments:

> Please please please incorporate social networking into the classroom. Please please offer more hybrid and web enhanced classes. That would make life SOOOO much easier, and I will be able to withstand the temptation to leave and join one of those online colleges a lot more. :-) (Female, 25, loves new technologies, prefers courses using extensive amount of technology)

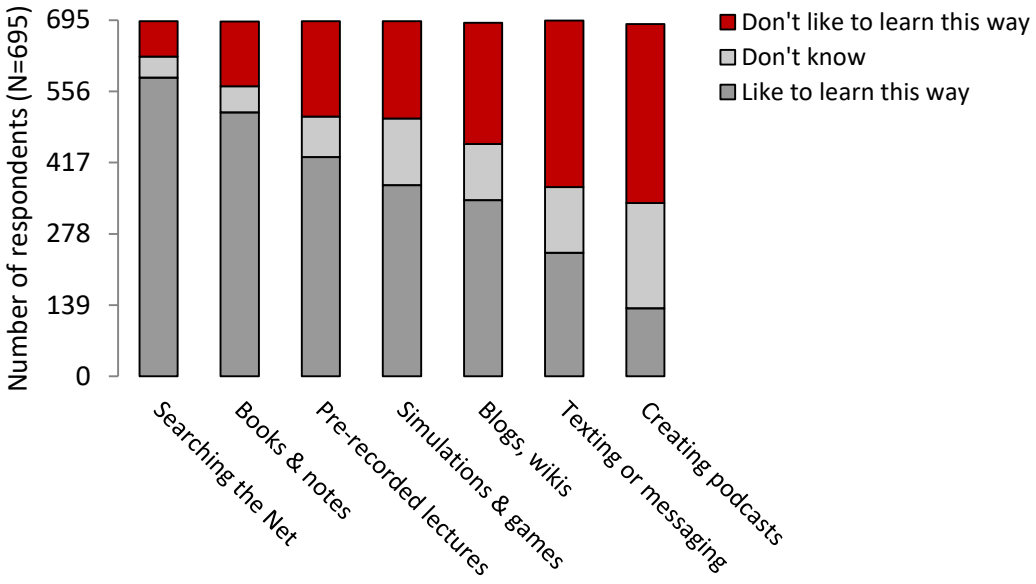
In light of comments such as this, we might expect activities related to academics to be part of the frequent social networking activities reported by respondents. However, this is not the finding. A summary of these reported activities is presented in Figure 6, where we observe that student-to student communication is definitely facilitated via social networks, but not student-to-instructor communication. Our figures for these communication questions very closely resemble data reported for the ECAR 2010 survey (Smith, Caruso, & Kim, 2010). Other activities somewhat tied to academic work include getting information for class and completing assignments, and neither of these appears to have widespread adoption.

Figure 6. Reported uses of social networking tools; spring 2010 sample.



We asked participants to indicate their learning preferences directly, asking them to rate a set of technologies as they relate to their learning style; we report these in Figure 7. The majority of our respondents reported preferences for passive, information-gathering learning activities such as searching the Internet, using textbooks, and taking notes. Listening to or watching podcasts or webcasts was overwhelmingly dispreferred (somewhat to our surprise), or at least viewed with uncertainty.

Figure 7. Reported learning preferences; spring 2011 sample. Actual survey text: Searching the Internet; Using hardcover textbooks for reading and note-taking; Listening to or watching audio or video recordings of lectures; Programs I can control, such as simulations, video games, online demos, etc.; Contributing to websites, blogs, wikis, etc.; Text-based conversations over email, IM, and text messaging; Creating my own podcasts or webcasts.



One final set of questions probing preferences about technology asked students to indicate their overall attitude towards new technologies and their preferences for the amount of technology used in their courses.

The majority of the respondents in both samples reported being neutral about new technologies (close to 40%), and preferring moderate amounts of technology used in their courses (slightly over 50%). The large majority of our respondents are far from being intrepid early adopters willing to experiment with new tools as they work on their credit-bearing degrees. Instead, their self-ratings reveal what the following set of comments illustrate:

> Don’t let technology destroy the teacher, student relationship. Especially with academic advisers and even within the Queens College staff… (Male, 19, neutral about new technologies, prefers courses that use a limited amount of technology)

> Traditional face-to-face courses without excessive technology use would greatly improve social interaction and allow for possible long-term relationships and connections. (Male, 20, skeptical of skeptical of new technologies, prefers courses that use a limited amount of technology)

> …real learning takes place in the classroom. No interactive high tech. tool will ever replace a good or even not so good professor. (Female, 21, skeptical of new technologies, prefers courses that use a limited amount of technology)

> How about dumb classrooms instead of smart classrooms? If find that most of the time, we don't use the computers, and they tend to block my view. (Male, 27, likes new technologies, prefers courses using no technology)

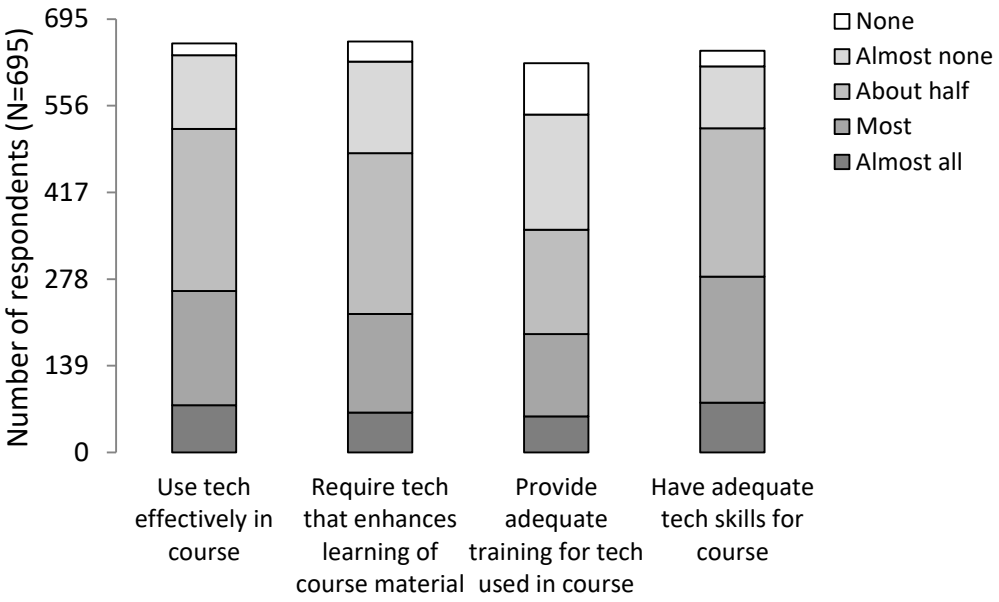
Just as in the preceding section we concluded that our students' access to technology is pervasive, the data presented in this section strongly suggest that our students' access to and enthusiasm about technology is disconnected from their academic lives. They are generally reluctant to use laptops in class, they fail to exploit social networking tools for engaging with their academic networks, their academic use of software is generally restricted to ordinary word processing and slideware tools, and their learning preferences and overarching preferences for technology in their courses are rather conservative. This finding is surprising, particularly in light of discourse about the unique learning styles of the "Net Generation" Digital Natives that make up the majority of our students. This personal-academic technology disconnect deserves further analysis, to which we turn in the next section.

Speculations on the Source of the Disconnect

One way of understanding this disconnect between academic and personal technology has already been suggested: students' perceptions of technology are biased based on the relevance of the particular technology to mastering the course material. When the tool is not made relevant by the instructor, it is disregarded or perceived negatively. It should not be surprising that laptops are perceived to be useless in classrooms that discourage their use. Also, software that might have discipline specific uses, but whose use is not explained nor encouraged by instructors will not be sought out by students who may not be familiar with such technologies.

One way our dataset speaks to this speculative explanation is through questions, asked in the 2011 survey only, about students' perceptions of the degree of sophistication of their instructors' use of technology. Responses to this set of questions, reported in Figure 8, reveal that students are generally not impressed with their instructors' basic technological preparation, and that they find limitations in their professors' ability to use technology effectively, to use technology that stimulates learning, to train students.

Figure 8. Perceived distribution of instructors who use technology effectively, in ways that promote learning, provide adequate training, and have sufficient technology skills; spring 2011 sample.



In fact, many of the comments in both surveys directly speak to lack of preparation on the part of faculty:

> Teach professors how to use PowerPoint effectively
>
> I would love to see experienced professors get familiar with technology. I have taken amazing classes with wonderful professors who could not even do email.
>
> Professors should be trained in all facets of technology pertaining to the course (projectors, spreadsheets, etc.). All professors should have a fair knowledge of technology in order to enhance the retention of course material.
>
> I don't mind the use of technology in classes, so long as it is reliable and the instructors themselves can teach others how to use it.
>
> Use of technologies at Queens College from my experience in classroom setting is very dependent on the instructor's ability to use technology. At times it is detrimental because they may not use it or not use it well. Unfortunately, it needs also better management but those in charge may not always understand its use and implementation so it may fail to be useful. (Male, 41-50, loves new technologies, prefers taking courses with limited technology)

As distressing as these perceptions might be, they suggest a very direct solution: faculty development programs that expose instructors to a range of technologies that might be

deployed to engage students in the disciplinary discourse, and that integrate discussion of pedagogically sound applications of those technologies.

Connected yet Disconnected: Applications and Summary

The picture painted by the data reported above offers us some important insights that we are using locally to continue to drive technology initiatives on our campus, and which we are using to design future surveys and to drive focus group discussions and other qualitative explorations of our students' perceptions and uses of technology. We are convinced that knowing more about our students will put us in a much better position to design learning environments, both physical and virtual, and to train faculty to use tools more purposefully.

We have used parts of our dataset to instigate discussions in faculty development seminars, and the results are typically highly positive. Using facts to discuss with faculty what we perceive as important trends in our student population lends more validity to the discussion, and triggers conversations that invariably lead to insights about pedagogy.

The dataset is also proving useful in discussions with decision makers, who are more likely to be persuaded by data-driven recommendations about technology funding. Data from our survey could help inform not only how classrooms are outfitted, but also the direction in which the college might steer itself with respect to online or hybrid course offerings. Such institutional use of our data would require more regular data collection.

There is occasional disbelief about the patterns that emerge from the dataset, as well as concerns about the representativeness of the sample. Planned explorations of the data will help us determine whether differences exist between participants from lower socio-economic status, or for participants who work full-time or have dependents at home. As we prepare for future opportunities to administer new versions of these surveys, we are looking to make special outreach efforts to groups that might have been under-represented in the existing dataset.

To summarize, the data reported above demonstrate some degree of comparability between the non-traditional students at Queens College and students in national surveys, with respect to access to technology in their personal lives. Our data also correspond with nation-wide findings of disconnect in the use and perception of technology for academic versus personal purposes. Our students have mixed feelings about widespread use of technology for teaching and learning. We have speculated that these contradictory responses might be related to the relatively inexpert uses of technologies for teaching and learning, by a faculty corps that is perceived by students to be under-trained in the digital tools of the 21st century—faculty who might have not yet discovered how to exploit in the academic environment their own evolving talents in using technology in their personal lives. One way to address the disconnect between the personal and the academic involves providing strong, varied, and well-supported faculty development.

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