

BALANCING ACT:

# How College Students Manage Technology While in the Library during Crunch Time



BY ALISON J. HEAD, PH.D. AND MICHAEL B. EISENBERG, PH.D.

PROJECT INFORMATION LITERACY RESEARCH REPORT

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**Abstract:** The paper presents findings from 560 interviews with undergraduates on 10 campuses distributed across the US, as part of Project Information Literacy (PIL). Overall, the findings suggest that students use a “less is more” approach to manage and control all of the IT devices and information systems available to them while they are in the library during the final weeks of the term. In the hour before we approached them for an interview, more respondents had checked for messages (e.g., Facebook, email, texts, IMs) more than any other task while they were in the library. A majority of respondents who had checked for messages during the previous hour had also prepared assignments and/or studied for courses. More respondents reported using library equipment, such as computers and printers, more than they had used any other library resource or service. Over half the sample considered their laptop their most essential IT device and most had a Web browser and, to a lesser extent, a word processing application running at the time of the interviews. Most students were using one or two Web sites at the time of the interviews, but there was little overlap among the Web sites they were using. A large majority of the respondents could be classified as “light” technology users, i.e., students who use one or two IT devices to support one or two primary activities (at the time of the interviews). A preliminary theory is introduced that describes how students’ technology usage may be influenced by locale (i.e., the campus library) and circumstance (i.e., crunch time). Recommendations are made for how campus-wide stakeholders—faculty, librarians, higher education administrators, and commercial publishers—can work together to improve pedagogies for 21st century undergraduates.

## Introduction

During “crunch time,” college students, like generations before them, still congregate in the campus library. However, the way that they now research and study within those facilities, many of which still have stacks lined with books and bound journals, has profoundly changed.

With heads bent before flickering screens and fingertips tapping the keyboards, today's students rarely enter the stacks or consult a librarian. Instead, they seek out the quiet of the library as a refuge from distractions and a space in which to forage, select, create, and communicate in a vast and constantly changing digital universe. Most use a few information sources they have independently cobbled together.

Within the course of an hour, a typical student may outline a research topic, draft the opening paragraph of a paper, post a status update on Facebook, check out club and theater listings for Friday night, and IM several friends—without ever getting up from his or her seat or cracking open a library book.

Conversely, for today's undergraduates, the computing devices on which they so readily depend on can also be an endless source of distraction. Figuring out how to balance productivity and social diversion despite the temptations of their technology is one of the most significant challenges of being a student in the digital age.

Project Information Literacy (PIL) is a national research study based in the University of Washington's Information School.<sup>1</sup> In our ongoing research, we study how college students conduct research and find information for their coursework and for the demands of their everyday lives. We also explore the needs of these students, and the unique approaches, strategies, and workarounds that characterize their information-seeking behavior.

In this research report, we present findings from an investigation of how college students manage and use technology during crunch time: the final weeks of the term. At the same time, we explore deeper issues about how college students use libraries, how and why different kinds of technology use occurs in libraries, and how the activities of research, studying, and learning may be evolving in the digital age. Our results and conclusions are based on 560 interviews conducted with undergraduates in libraries on 10 US college and university campuses during the spring of 2011.<sup>2</sup>

### Major Findings

Even though students we interviewed were using information technology (IT) devices to stay in constant touch with their social sphere, the majority of students were also getting down to the nitty gritty demands of preparing assignments and studying for classes while in the campus library. Most considered the library a place that was a safe harbor from everyday distraction.

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<sup>1</sup> Project Information Literacy (PIL) is co-directed by Alison J. Head, Ph.D., Research Scientist in [The University of Washington's Information School](#) and Fellow in the [Berkman Center for Internet & Society](#) (2011-2012) at Harvard University and Michael B. Eisenberg, Ph.D., Professor and Dean Emeritus in The University of Washington Information School. This PIL study was supported with contributing funds from [Cable in the Classroom](#) and [Cengage Learning \(previously Gale\)](#). Communication about this research report should be sent to Dr. Alison Head at [ajhead1@uw.edu](mailto:ajhead1@uw.edu) and Dr. Michael Eisenberg at [mbe@uw.edu](mailto:mbe@uw.edu).

<sup>2</sup> The institutions in the sample were California Maritime Academy (CSU), City College of San Francisco, Columbus State Community College (Delaware Campus Branch Library), Northern Kentucky University, Ohio State University (i.e., Science and Engineering Library and Thompson Library), Saint Mary's College Library of California, Santa Rosa Junior College, Tufts University, University of Puget Sound, and The University of Washington.

Moreover, very few students in our sample were using devices with unbridled caprice. Instead, most students weathered the final weeks of the term by applying self-styled techniques for dialing down their devices and reining in the Web sites and applications they were using while in the library.

All in all, our findings suggest that students while in the library, may be trying to mindfully manage technology when the pressure is at its most intense, using practical and reliable methods to harness IT devices for working more efficiently, staying focused on coursework, conserving their ever-dwindling time, and still remaining connected to the people in their lives.

Our major findings are as follows:

1. During one of the busiest times of the academic year, the students we interviewed were mainly using different IT devices to stay in touch with their friends while they were in the campus library. In the hour before we interviewed them, 81% of the students in our sample had checked for new messages (e.g., email, Facebook, IMs, texts).
2. At the same time, many of the same respondents who said they had checked for messages had also prepared assignments for submission (60%), studied and reviewed materials for class (52%), and satisfied personal curiosity with a computer search (e.g., sports score, news, gossip) (45%).
3. Despite the pressing need to complete assignments at crunch time, few respondents reported having used the full range of library resources and/or services during the previous hour. Many more respondents said they had used library equipment (39%) such as computers and printers than anything else, including scholarly research databases (11%), library books (9%), face-to-face reference (5%), and/or online reference (2%).
4. Overall, we found most respondents (85%) could be classified as "light" technology users. These were students who used "only" one or two IT devices primarily in support of coursework and, to a lesser extent, communication. The most frequent combination (40%) of devices being used was a cell phone (including smart phones) with a personally owned laptop computer while they were in the library. In stark contrast, only 8% of the sample could be classified as "heavy" technology users.
5. For over half the sample, a personally owned laptop (58%) was the primary—most essential—device in use at the time of the interview. A smaller percentage of respondents (35%) were using a library desktop computer.
6. More than any other combination of applications, respondents had both a Web browser and a word processing program open at the same time (47%) while they were in the library.
7. Despite the vast universe of information available on the Web, the majority of respondents (61%) only had one or two Web sites open at the time of the interviews. Moreover, *all* of the respondents had created some type of highly individualized information spaces for use in the library (i.e., the Web sites and applications each student uses to study, research, communicate, and play).
8. There was little overlap in the Web sites that were being used from one student to the next, although more respondents had Facebook (13%), a personal email account (e.g., Gmail) (11%), and/or a learning management system (e.g., Moodle) (9%) open when interviewed.

**...we found most respondents (85%) could be classified as "light" technology users.**

9. Two-thirds of the sample (65%) said they had some experience using social media sites, such as Facebook, online forums, Twitter, or YouTube, while engaged in the current term's coursework. For example, students in post-interview discussions described using Facebook to coordinate meetings with fellow classmates.
10. To a lesser extent, a small set of self-starter students described using social media sites, such as Facebook, online forums, and YouTube to create new studying and learning practices. In these cases, sites were used out of intellectual curiosity and/or to excel in courses or grasp course material they did not fully understand.

Overall, our findings reveal consistent patterns from respondents that do lend credibility to our findings about how a sample of students used technology in campus libraries during the final weeks of the term. However, given the size of the sample and our research methodology, these findings should not be viewed as comprehensive, but rather as exploratory and as another part of ongoing research.

In the following pages, we present detailed findings from our analysis in three parts:

1. Part One presents findings about the tasks students in the sample said they were performing and the resources and services they had used while in the library during the previous hour.
2. Part Two features findings from our inventory about the IT devices respondents were using at the time of the interview and the primary activities each device supported. A typology of technology users is presented from this data.
3. Part Three describes the *individualized information spaces* students had created on the screens of their primary device at the time of the interview. Individual information spaces consist of Web sites and applications students use to study, research, communicate, play—and multitask.

## Approach

Our ongoing study is grounded in research on information-seeking behavior. PIL studies the ways which college students conceptualize and operationalize course-related and everyday life information-seeking processes. We investigate these processes through students' accounts, reports, and experiences.

The purpose of this specific PIL study was twofold: (1) to learn how students manage and use technology during the final weeks of the term, and (2) to understand what IT devices and applications (e.g., Web sites, programs) students select and use for creating *individual information spaces* while in the library.<sup>3</sup>

Four research questions framed our study:

1. What tasks did students say they had been doing, and which library resources and services had they been using in the campus library in the previous hour?

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<sup>3</sup> See Appendix A for more details about the study's research methods, for descriptive data about the sample, and for which institutions participated in the study. In addition, see page 61 of this report for a discussion of interviews and limitations as a research method and what we did to compensate for these issues in our study design.

2. What IT devices (e.g., laptops, library desktop computers, cell and smart phones, MP3 players) did students have running at the time of their interviews? For what primary purpose was each device being used? What combination of devices was used for multitasking?
3. Which device did students consider indispensable for what they were doing at the time of their interviews? Moreover, what applications and Web site, did students have open and running as part of their individualized information spaces?
4. How frequently were social media sites, such as online forums, Facebook, Twitter, and/or YouTube, used by students in relation to carrying out coursework and studying during the entire term? What new learning practices were students using as a result?

## The Interviews

From April 7 through May 26, 2011, the PIL Research Team conducted 560 face-to-face interviews with full-time freshmen, sophomores, juniors, and seniors two to three weeks before finals week began. We collected data from full-time credit students in 11 libraries in 10 US four-year institutions and community colleges.<sup>4</sup>

To select our sample, we used a multi-stage cluster sample plan. We identified clusters by the number of areas where students tended to congregate in each library setting (i.e., reference room, computer banks, study tables, study carrels, study rooms, and soft furniture). Interviews were held at different times when the library was reportedly in higher use.<sup>5</sup>

We approached students who appeared to be using an IT device(s) while they were in the library. Those students who were visibly using IT devices within the overall library population constituted about 85% to 90% of entire study sample within the 11 library settings.

This means the remaining 10% to 15% of the students who were in the library were not visibly using IT devices at the time of our interviews. PIL researchers observed this smaller percentage of students most frequently reading a (physical) book(s), reviewing course notes in a binder, writing a draft out by hand, and/or working on problem sets on paper.

The interviews with our sample of technology users ranged from 5 to 20 minutes in length, including the interview debriefing and an optional post-interview discussion. We asked respondents which tasks they had been doing in the previous hour while they were in the library.<sup>6</sup>

We also collected data about the IT devices students were using and the kinds of activities students said the devices were being used to support (e.g., communication, coursework, entertainment, personal research, and/or scheduling). We concluded our sessions with a debriefing about the study and optional post-interview discussions with respondents.

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<sup>4</sup> At Ohio State University (OSU), interviews were conducted at both Thompson Library (n = 50) and the Science and Engineering Library (n=50), by PIL researcher, Elizabeth L. Black, assistant professor and systems librarian for Ohio State University Libraries, who was on Faculty Special Assignment to work on the PIL study.

<sup>5</sup> Librarian research liaisons, working at each institution in our sample, informed our team of the busiest times in their libraries, so we could plan our data collection visits. We tended to visit library sites on weekdays, especially Wednesdays and Thursdays, as well as hours in the evening and on weekends.

<sup>6</sup> At the outset, it should be noted that we fully acknowledge that students use the library for longer than an hour. In our study, we set out to study what was happening in the library on a microscopic level in order to provide a snapshot of what a sample of students were doing when the pressure was most intense within a given time frame.

## The Inventory

Our inventory consisted of a count of IT devices students had turned on and *in use*. These devices included cell/smart phones, personally owned laptops, library desktop computers and laptops, netbook/mini computers, tablets (e.g., iPads), media/audio players (including iPods), mini tablets (e.g., iPod Touches), eBook readers (e.g., Kindles), and scientific calculators.

We define *in use* as being a state where a device, an application, or a Web site is “open” and “running” and ready to be used and/or already in active use. For instance, we counted a cell phone as *in use* if it was actively receiving incoming text messages and notifying the user that a message had just come (i.e., often in the library a vibration when the cell phone was set to silent mode). We also counted a Web site as being *in use* when it was open in a browser and was accessible from the desktop or the task bar and was or/had been *in use* during a student’s current online session.<sup>7</sup>

The inventory was used for investigating the *individualized information spaces* students created on the screens of their primary devices (i.e., laptops or library desktop computers). We define individualized information spaces as the applications and/or Web sites a student had open and running to support his or her information-seeking activities. Our preliminary research suggests that students build and create individualized information spaces in order to study, research, communicate, play—and multitask.<sup>8</sup>

We also collected inventory data about which device students considered their primary device and which applications and Web sites students had running on that device at the time of our interview. We used these data as a basis for developing a typology of *light and heavy technology users*.

## Multitasking Defined

We used interviews and the inventory in our study to investigate how a sample of undergraduate students in 10 different institutions managed and were using IT devices during crunch time. In a broader sense, our study explores how students may be *electronically multitasking*—using different IT devices in pairings and in quick succession to perform multiple tasks (e.g., using a cell/smart phone for communication while using a laptop for coursework).<sup>9</sup>

Originally, the term *multitasking* referred to the parallel processing abilities of computers. Since the 1990s, however, *multitasking* has crept into the English vernacular. Multitasking is now used to describe how humans try to do more than one thing at the same time.

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<sup>7</sup> We excluded cases where a respondent had a Web site open and on his or her desktop but had just forgotten to close it after one of his or her prior online sessions from before our interview.

<sup>8</sup> During our 2008 focus groups (n = 86), we found the variety of applications and Web sites serve as the backdrop of students’ information worlds for course-related research assignments. Among the applications that participants in our focus groups mentioned having on their desktops were Facebook, a sports site, an academic article from a library database, YouTube, Google, and versions and drafts of assignments they were working on. Before we began collecting data for this study, we pre-tested the interview script with 17 students and their individualized information spaces also consisted of word processing programs, Web browsers running personal email, Google (search), and/or Facebook.

<sup>9</sup> We make a key distinction between multitasking (attention and task-switching) and IT device usage. We did not collect quantitative data about how often respondents were switching their attention between tasks and activities by using data collection methods such as eye tracking. Rather, our study focused on what IT devices respondents were using, the applications and Web sites they had running on their primary devices, and the tasks they were conducting while they were in the library during crunch time. For a study of electronic multitasking, see K. Stephens and J. Davis (2009). The Social Influences on Electronic Multitasking in Organizational Meetings. *Management Communication Quarterly*, 23: 1, 63-83, from <http://mcq.sagepub.com/content/23/1/63.abstract> (accessed August 9, 2011).

Multitasking tends to occur at a fairly rapid pace and by harnessing the power of different information technology devices. Some everyday examples are driving while talking on a cell phone, or listening to music while reviewing a chapter in a textbook.

The mainstream media seem to emphasize that many people are multitasking under any conditions and, in particular, that college students are constantly multitasking.<sup>10</sup> But scholarly research has found most people cannot perform more than one complex information-processing task at a time and—here is the key—*switch their attention*.<sup>11</sup> For example, most people cannot search JSTOR for an article about Shakespeare and add a column of numbers with a calculator at the same time.

With this understanding, the meaning of multitasking expands to encompass the task- and attention-switching that occur when humans go between one task and work on another (or several) task(s) in relatively quick spurts of time. For the purposes of our study, we therefore define *multitasking* as the rapid and sequential switching of tasks and attention to meet two or more different goals.

## Detailed Findings

### Part One: The Library Setting during Crunch Time

*It's the vibe of the library that brings me here—everyone is working on something, everyone is getting something done—it spreads through the room.*

*- Humanities student in a post-interview discussion*

Librarians have long kept track of how their library is being used. Metrics have included what materials are being circulated, how many reference questions have been answered, how many patrons pass through the entry gates, and what vendor statistics show about networked resource usage and users' search queries.

Output measures such as these are widely used for strategic planning, accountability, and funding in today's libraries.<sup>12</sup> These measures, unfortunately, only go so far in describing how students are using the library setting.

We began by asking different questions to understand libraries and library use during crunch time. Overall, our study asked how students use and manage technology along with other tasks they are doing while they are in the library setting during crunch time. Specifically, what tasks had

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<sup>10</sup> See M. Cronin, (2010, 18 January). 'Rude' Texting Students say they're only Multitasking. *TribLive* from [http://www.pittsburghlive.com/x/pittsburghtrib/news/pittsburgh/s\\_662753.html](http://www.pittsburghlive.com/x/pittsburghtrib/news/pittsburgh/s_662753.html) (accessed September 16, 2011).

<sup>11</sup> For a discussion of the complexities of defining multitasking, see C. Dzubak (2011). Multitasking: The Good, the Bad, and the Ugly. *The Journal of the Association for the Tutoring Profession*, 4, from [http://www.myatp.org/Synergy\\_1/Syn\\_6.pdf](http://www.myatp.org/Synergy_1/Syn_6.pdf) (September 16, 2011). For a seminal study about the limitations of simultaneous multitasking, see E. Ophir, C. Nass, and A. Wagner (2009). Cognitive Control in Media Multitaskers. *Proceedings of the National Academy of Sciences*, 106: 15583-15587, from <http://www.pnas.org/content/early/2009/08/21/0903620106.abstract> (accessed September 16, 2011).

<sup>12</sup> For an in-depth discussion of the efficacy of output measures see M. Oakleaf (2010). The Value of Academic Libraries. *Association of College and Research Libraries*, from [http://www.ala.org/ala/mgrps/divs/acrl/issues/value/val\\_report.pdf](http://www.ala.org/ala/mgrps/divs/acrl/issues/value/val_report.pdf) and M. Kyriillidou (2002). From Input And Output Measures to Quality and Outcome Measures, or, from the User in the Life of the Library to the Library in the Life of the User. *Journal of Academic Librarianship*, 28,1/2, 42-6, preprint available from <http://www.arl.org/bm-doc/jal01.pdf> (accessed August 9, 2011)

respondents done and what library resources and services had been used during a finite time period—the previous hour?

To answer these questions, we investigated two related areas of library use: (1) the general tasks the students in our sample said they had been doing in the library in the previous hour, and (2) the library resources and services students said they had used in that same time frame.

As a first step in this analysis, we asked respondents whether they had done any of 7 different tasks in the previous hour. Two of these tasks were technology-based (i.e., checking for messages and using a computer for personal research) and the remaining 5 of the tasks could be accomplished either with or without a computer (i.e., preparing an assignment, studying for a course, looking for materials, relaxing/killing time, and meeting with friends/classmates).

The results of our analysis appear in Figure 1. A chart breaking down the same data by four-year colleges and universities vs. community colleges appears in Figure 2 in what we have called, a “Data Details” chart throughout the report.

**Figure 1: What Were Students Doing while They Were in the Library?**



<b>FIGURE 2 DATA DETAILS: Tasks Being Done while in the Library in the Previous Hour</b>	<b>Within Four-Year Institutions (n = 413)</b>	<b>Within Community Colleges (n = 147)</b>	<b>Institutional TOTAL (n = 560)</b>
Checking for messages (e.g., email, Facebook, texts, and IMs)	352 85%	101 69%	453 81%
Preparing an assignment(s) for submission (e.g., writing a paper, working on problem sets)	309 75%	99 67%	408 73%
Studying for course(s) (e.g., reviewing, reading materials)	269 65%	79 54%	348 62%
Using a computer to satisfy a personal curiosity (e.g., checking a sports score, news, weather)	213 52%	65 44%	278 50%
Hanging out and "killing time" between classes	156 38%	69 47%	225 40%
Looking for materials for courses (includes library research as well as online and offline research)	139 34%	64 44%	203 36%
Meeting with friends and/or classmates	120 29%	39 27%	159 28%

*Total n = 560 students (n = 413 in four year institutions and n = 147 in community colleges).*

We summarize the findings about student activities in the library as follows:

1. More than any other task, students (81%) said they had checked for messages using a variety of different devices in order to keep up on email, Facebook, IM, and/or texting while they were in the library in the previous hour.
2. In a breakdown by type of institution (see Figure 2), more of the respondents in four-year colleges and universities (85%) claimed to have been checking for messages in the previous hour than their counterparts in community colleges (69%).
3. Nearly three-quarters of the respondents (73%) said they had been working on assignment(s) they needed to turn in. A smaller percentage (62%) said they had been studying and reviewing course materials in the library in the previous hour. In addition, more students enrolled in four-year schools said they had done both of these tasks than did students in community colleges.
4. Five in 10 students (50%) reported they had logged on to check something about the world beyond the school, such as the latest sports scores, breaking news, and/or gossip about newsworthy topics (e.g., the Royal Wedding) in the previous hour.<sup>13</sup>
5. Keeping up with current events and satisfying a personal curiosity happened more often with respondents in four-year institutions (52%) than with students in community colleges (44%).
6. Despite the end-of-semester rush, two-fifths of students said they had been hanging out in the library between classes (40%). Moreover, far fewer students in the sample claimed to have met up with friends and/or classmates (28%) in the course of the last hour.

<sup>13</sup> While we were in the field conducting interviews, the Royal Wedding of Prince William and Catherine Middleton occurred on April 29, 2011 and received extensive media coverage.

7. More of the respondents in community colleges (47%) reported using the library as place of leisure than their counterparts in four-year institutions (38%).
8. More than one-third of the respondents (36%) said they had looked for materials for courses in the library during the previous hour, using print and/or online sources.
9. More students in community colleges (44%) reported they had looked for materials in the previous hour than students in student in four-year institutions (34%).

Taken together, these findings provide a snapshot of what students were up to in the library during one of the busiest times of the academic year. Above all else, we found that more respondents had attempted to remain connected using some sort of IT device more than any other tasks within an hour’s time. These findings suggest that communication and keeping in contact are woven into the fabric of these college students lives, no matter where they live, what institution they attend, and what technology they are using. As one student studying arts and humanities explained in an interview:

*We are always in touch—it's the nature of who we are. Time is always crunched and cell phones work—it comes down to accessibility and the convenience. I text my mom while I walk to class or if I am in here, knowing she would rather have me call, but she texts back—even though she's still learning to text. That's how it is.*

This raises a central question of our research. How much of an overlap was there among these tasks? In other words, what else, if anything, were respondents who had been checking for messages been doing in the library? In Figure 3, we present the results of a follow-up analysis. We used cross tabulations to find what percentage of respondents who had checked for messages had also performed other tasks in the library in the previous hour.

**Figure 3: Checking for Messages with Other Tasks?**

<b>In Combination: Checking for Messages + Other Tasks</b>	<b>Count and Frequency (n = 560)</b>
Checking for messages + preparing an assignment for submission	335 60%
Checking for messages + studying for courses (e.g., reading, reviewing)	290 52%
Checking for messages + using a computer to satisfy a personal curiosity	250 45%
Checking for messages + hanging out/relaxing between classes	195 35%
Checking for messages + finding materials (includes library research)	156 28%
Checking for messages + meeting friends/classmates	135 24%

*Total n = 560 students (n = 413 in four-year institutions and n =147 in community colleges)*

The same respondents who said they had checked for messages also claimed they had prepared assignments for submission (60%) and had studied and reviewed materials for class (52%) in the previous hour.

To a lesser degree, students who had checked for messages said they had also used computers to catch up with news and satisfy personal curiosity (e.g., sports scores, news, gossip) (45%), hang out between classes (35%), find materials (28%), and meet friends/classmates (24%).

As a whole, these findings helped us explore the multitasking behavior of the sample, as far as how respondents were pairing two different tasks. The findings suggest the task of checking for messages is a complementary one. We found that communicating—checking for messages—was interspersed with other tasks, especially course-related ones over the course of an hour.

Accordingly, when we checked the *mode* for the interview question, we found that more respondents had been checking for messages, preparing an assignment, and/or studying for courses than had not.<sup>14</sup> Overall, our post-interview discussions with respondents lent support to this interpretation and revealed qualitative details about what the complementary task of checking for messages entailed.

### **Student Discussions: Time for a Facebook Break**

Throughout our interviews, the topic of Facebook came up more frequently than any other. Many students in our sample said they checked Facebook every 10 or 15 minutes. Other students said they checked the social network site at regular intervals (e.g., every hour or two). Still others said they logged onto Facebook out of habit as soon as they turned one of their IT devices—Facebook was always open for these students.

Moreover, we found while students were in the library, they appeared to alternate between completing coursework and checking for messages—usually on Facebook and to a lesser extent, on email and/or text messages on their cell/smart phones.

Many students described the need for taking what one student called “a Facebook break” while progressing through assignments. One student explained, “If I get done reading a chapter, then I get on Facebook as a reward.”

From our post-interview discussions, we learned that despite the frequency with which students checked Facebook, they were using the site for reasons other than communication. That is, a majority of respondents said they also used Facebook as: (1) an incentive for getting coursework done, (2) a cognitive break from the self-perceived intensity of working on papers/assignments, and/or (3) a virtual security blanket where comfort is derived by being surrounded by friends and family.

As a student in the social sciences explained:

*When I'm writing an essay, after a while my thoughts begin to just blend from one paragraph to the next, it isn't coherent anymore, so I know I need a break. I go to Facebook to see what's going on—it's my comfort zone, clears my thoughts, and then I can make the essay coherent again.*

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<sup>14</sup> In statistics, the *mode* is the most frequently occurring response by the sample. In this case, the mode was “yes” when we asked respondents if they had been checking for messages, preparing an assignment, and studying for courses while they had been in the library during the previous hour. For the other categories in Question #1, the mode was “no.”

According to a student in business administration:

*I'll have Facebook up all of the time and I use it to distract me so I don't burn out. I'll work a little bit and then check Facebook and then I can return to work. It keeps me from repeating myself. I'll use Facebook to communicate with other students about the assignment, too.*

A student who was still undecided on a major said:

*I definitely use Facebook—it's a good break. And it's a good way to procrastinate, too. So, basically Facebook is also our enemy. But it's great for communication. I use it to keep in touch with all my family in Mexico.*

Other students described using Facebook as an irresistible impulse, as a kind of compulsive behavior. When these students happened to glance up while they were studying in the library and they saw another student using Facebook, they became “very distracted” and had to go to their Facebook page, too. For these students, checking Facebook was like a yawn—a reflexive action that was nearly impossible to resist.

But not all students in our discussions succumbed to Facebook. In fact, we found some evidence of a growing abandonment of Facebook.<sup>15</sup> One-third of the students in our post-interview discussions said they had gotten rid of their Facebook account altogether or checked the site so infrequently that they did not even consider themselves true Facebook users.<sup>16</sup>

**For these students, checking Facebook was like a yawn—a reflexive action that was nearly impossible to resist.**

Some students had closed their Facebook accounts when the scholastic pressure was most intense. Other students choked out the temptation of Facebook before it could even occur by cancelling it altogether.

An engineering student said:

*During finals week, I find Facebook to be far too distracting, so I change my password to Facebook and I walk away from the screen before I can see the new password. That way, I have no idea what the new password is. Now that keeps me off Facebook for sure.*

A student working on general education requirements explained:

*I'm not on Facebook anymore. Life is better. This way, I'm not tied down to a computer. With Facebook, you have to be connected all the time. If you're not on Facebook, people have to talk to you face-to-face.*

<sup>15</sup> Findings from a preliminary study in 2011 of 84 students at the University of Pennsylvania found Facebook was the least essential communication channel, compared to email, texting, and cell phone calls. See A.Mir (2011). How Long Could You Go Without Facebook? *Wall Street Journal*, from <http://blogs.wsj.com/digits/2011/04/21/how-long-could-you-go-without-facebook/> (accessed August 9, 2011).

<sup>16</sup> In our follow-up discussions 60 students in our total sample (11%) discussed Facebook in great detail. One-third of these respondents—20 students—were “anti-Facebook” and said they used the social network site very infrequently (once a month, at most) or not at all.

According to a student in the sciences:

*Chatting, Facebook, and games and texting are for people who have leisure time. I have 15 things to do alone today! I can't get involved with all of that. I removed myself from all of that.*

Despite some students expressing resistance to Facebook, we found the ubiquity—the sheer omnipresence—of Facebook made it a force this generation of students had to contend with, whether they had 600 Facebook friends or none at all. Whatever their circumstances, nearly all of the students we interviewed were well versed in the pros and cons of using Facebook and how they had chosen to manage its use.

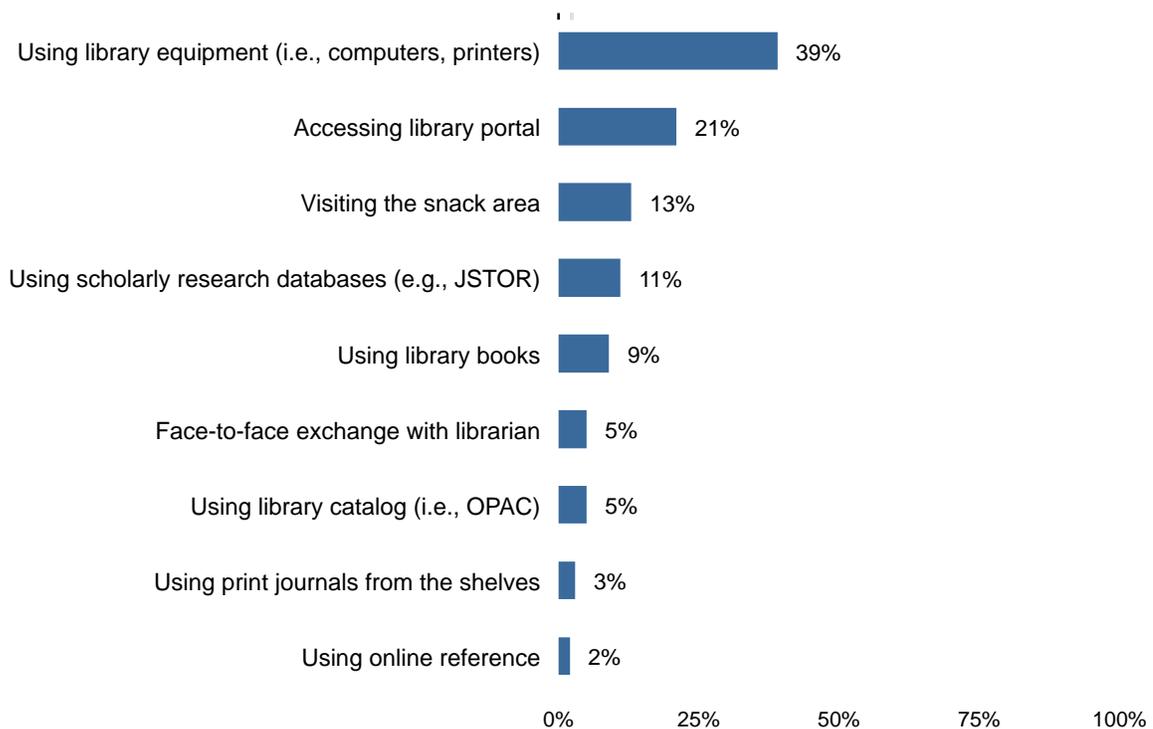
### Use of Library Resources and Services

As the next step in our investigation, we determined the use of library resources and services. In particular, we interviewed students in the sample about how they used the vast collection of information resources and supportive services that most of the libraries in our sample provided.

We asked how students in our sample were using library resources and services during the previous hour while they had been in the library. Which resources and services had most of the respondents used and which had they not?

Overall, we asked respondents if they had used 9 library-related resources and services. Five of these questions were technology-based resources and services the library provided. The results appear in Figure 4 and in Figure 5 in an accompanying data details chart.

**Figure 4: Which Library Resources and Services Had Students Used?**



<b>FIGURE 5 DATA DETAILS: Use of Library Resources and Services during the Previous Hour</b>	<b>Within Four-Year Institutions (n = 413)</b>	<b>Within Community Colleges (n = 147)</b>	<b>Institutional TOTALS (n = 560)</b>
Using library equipment (i.e., computers, printers)	147 36%	70 48%	217 39%
Accessing the library portal, including library Web pages	95 23%	21 14%	116 21%
Visiting the snack area/café	71 17%	4 3%	75 13%
Using online scholarly research databases (i.e., library databases, such as EBSCO, JSTOR)	51 12%	12 8%	63 11%
Using library books (includes from the shelves and eBooks) *	42 10%	11 7%	53 9%
Using the library Online Public Access Catalog (i.e., OPAC)	23 6%	6 4%	29 5%
Face-to-face exchange with a librarian (i.e., reference)	20 5%	9 6%	29 5%
Using print journals from the shelves (i.e., magazines and scholarly journals) *	12 3%	3 2%	15 3%
Using online reference (i.e., “Ask a Librarian” IM, email, or text-based systems)	7 2%	2 1%	9 2%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges).*

We summarize the findings the use of library resources and services as follows:

1. More than any other library service or resource, respondents said they had used the library’s technology equipment (39%), such as printers and library desktop computers, while they had been in the library in the previous hour.
2. When we broke down the results by type of institution (see Figure 5), we found far more respondents in community colleges reported their use of library equipment (48%) than their counterparts in four-year institutions (36%).<sup>17</sup>
3. Few students in the study claimed to have used the library collection—online databases, books, and/or journals—in the previous hour. Only one-fifth of the respondents claimed they had used the library portal (21%) and far fewer had used scholarly research databases (e.g., JSTOR) (11%), library books (9%), the OPAC (5%), and/or print journals from the shelves (3%) during the same time frame.
4. A breakdown by institutional type showed more students in four-year institutions in our sample said they had used online resources than those students in community colleges. Twice as many respondents in four-year schools (23%) said they had used the library portal and Web pages than did their counterparts in community colleges (14%). At the same time,

<sup>17</sup> Half of the institutions in the sample (50%) had a policy of subsidized printing available to students in the library.

the students we interviewed at four-year schools claimed they had used library databases (12%) more than respondents at community colleges (8%).

5. Few students in our sample claimed they had engaged in a face-to-face exchange with a librarian (5%). Far fewer had used an online reference service (2%) while they had been in the library in the past hour.
6. A further breakdown by institutional type showed the percentage of students in community colleges that said they had talked to a librarian in a face-to-face exchange (6%) was slightly higher than their counterparts in four-year institutions (5%).

Taken together, these findings suggest a majority of students may be underutilizing the library resources and services available to them—particularly during crunch time.<sup>18</sup>

One explanation may be students do not use library resources and services very much. Yet, another explanation may be that during crunch time is a time when students are more likely to be studying for final exams than finding information and conducting research for writing papers.

### Equipment Usage

As noted, more of the community college students than four-year students said they had used publicly available equipment—printers and computers—more than any other library service and/or resource.

One plausible explanation for this finding may be that community college students may not have access (i.e., ownership) to as much equipment as their counterparts in four-year institutions, simply because these students may not have the funds to purchase them.<sup>19</sup>

Another explanation may be community college students may not live on campus.<sup>20</sup> Therefore, students at community colleges may be more likely to print something out at the library or use a library desktop computer, instead of doing so at home.

At the same time, these same community college students use other library services and resources even less than four-year students (see the next section, “Library Database Usage,” for more details and explanation).

**...a majority of students may be underutilizing the library resources and services available to them — particularly during crunch time.**

<sup>18</sup> Academic libraries often state their mission as promoting “intellectual discovery” and “knowledge dissemination,” among other things. For example, see the mission statements of two four-year institutions in our sample: The University of Washington at <http://www.lib.washington.edu/about/strategicplan/mission-vision-values> and Saint Mary’s College of California at <http://library.stmarys-ca.edu/about/mission-policies/vision.html>, (accessed July 25, 2011).

<sup>19</sup> Despite their rising tuition costs in the last decade, affordability is still a hallmark of community colleges that makes a college education possible for students who cannot afford costly tuition rates at four-year institutions. The College Board Advocacy & Policy Center reports “for the 2010-11 academic year, average tuition and fees range from \$2,713 per year at public community colleges and \$6,224 at public bachelor’s colleges to \$33,679 at private doctoral universities,” (accessed July 29, 2011) from [http://trends.collegeboard.org/college\\_pricing/report\\_findings/published\\_prices](http://trends.collegeboard.org/college_pricing/report_findings/published_prices), (accessed August 1, 2011).

<sup>20</sup> Only one community college in our sample provided students with available on-campus housing.

## Library Database Usage

We found few students had used scholarly research databases (11%). Students in four-year institutions (12%) had used library databases slightly more than students in community colleges (8%) while they were in the library. Further, in a follow-up analysis, two-thirds of the respondents reported using databases were using JSTOR (37%) and/or Academic Search Premier (33%).

This finding raises some interesting questions, especially since we have found survey respondents in our previous PIL studies have been frequent users of library databases when conducting course-related research.<sup>21</sup>

One explanation for this discrepancy between PIL's ongoing research results may be that few of the respondents in this study were carrying out course-related research at the time of our interviews. In fact, in this study slightly more than one-third of the sample (36%) claimed to have been looking for materials, including library research, while they had been in the library in the previous hour (see Figure 1).

Another explanation for this finding may be more students who used library databases use them remotely from their living quarters, or elsewhere.

## Combined Uses: Library Resources and Services

As the final part of our analysis, we investigated whether the same respondents had used the library's technology equipment along with other library resources and services in the previous hour.

In particular, we explored what percentage of respondents who were using the library equipment also used other library resources and services. What pairings of library resources and services were students using more than others?

In Figure 6, we present the results of our analysis. The percentages represent how many respondents who had used library equipment had also used other library resources and services in the previous hour while they were in the library (based on the entire sample).<sup>22</sup>

In a larger sense, this analysis gives a picture of how many respondents multitasked, or switched their attention, from using pairs of different library resources and services.

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<sup>21</sup> See A. J. Head, and M. B. Eisenberg, (2010). "Truth Be Told: How College Students Evaluate and Use Information in the Digital Age," pp. 6 – 8. In our 2010 survey, 88% of the sample reported using scholarly research databases for course-related research and in our 2009 survey, 94% of the sample reported using the databases for the same purpose at [http://projectinfo.org/pdfs/PIL\\_Fall2010\\_Survey\\_FullReport1.pdf](http://projectinfo.org/pdfs/PIL_Fall2010_Survey_FullReport1.pdf). (accessed August 1, 2011).

<sup>22</sup> We treated the tasks respondents said they were doing in Figure 1 as being distinct from the library resources and services they said they were using in Figure 3, since the use of library resources and services are not necessarily task-based.

**Figure 6: Using Library Equipment with Other Resources and Services**

<b>In Combination: Use of Library Equipment + Other Library Resources and Services</b>	<b>Count and Frequency (n = 560)</b>
Using library equipment + the library portal	57 10%
Using library equipment + scholarly research databases	24 4%
Using library equipment + library books *	19 2%
Using library equipment + OPAC (i.e., library catalog)	14 3%
Using library equipment + online reference with a librarian	7 1%
Using library equipment + print journals from the shelves	8 1%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges)*

More than any other combination students used, more respondents—1 in 10—who said they had used library technology equipment in previous hour also said they had used the library portal’s Web pages while they had been in the library (10%).

At the same time, our findings suggest that very few students were using a range of library resources and/or services over the course of an hour during crunch time—together, or at all.

Overall, we found most respondents’ use of the library was independent of one-on-one services libraries provide (i.e., face-to-face and/or online reference). In our post-interview discussions, students described the library as more of a safe harbor—a refuge—than as a destination they went to when they needed information resources and supportive library services.

### **Student Discussions: The Library as Refuge**

It was the “library atmosphere” that was the draw, according to many students in our post-interview discussions. The library was often described as being a place where productivity has one of the best chances of flourishing.

The majority of the respondents described the value of the library as a place:

- (1) where they could witness other students engaged in “hard work,” and this often was contagious for them,
- (2) where they could rely on library equipment rather than their own devices that often had too many easy access distractions, including Facebook, and/or
- (3) where students could unplug entirely and work in solitude during the final weeks of the term.

For many students, it was highly motivating to see other students at crunch time. The library setting was conducive to getting something—anything—done.

A student who was still deciding on a major said:

*I live in the dorms and get distracted easily. I come to the library to get stuff done. I feel studious automatically by being here. Everyone is studying around me. We are all here for a common purpose.*

According to a student in the sciences:

*I come to the library so I'm sure to get something done, no matter what it is. Right now, I'm taking a break from studying and looking on recipes.com and I'll save some recipe to make tonight. If I was at home? I'd get up leave my work and just start cooking now.*

Other students said they relied on the library for its equipment. The library was, in this way, a means of separating them from the devices they had left elsewhere. In slightly different cases, students described the library as a unique refuge. These students described coming to the library as a last resort during the dwindling weeks of the term. Students could remove themselves from what distracted them most and seclude themselves in the library.

**The library setting was conducive to getting something—anything—done.**

A student in the social sciences explained:

*If I really want to get work done, I come the library and I use the library's computers—not mine. I don't bring my laptop because it has way too many things loaded on it that would distract me.*

A student in an occupational program said:

*I leave my laptop at home when I come here, so I won't check Facebook. Otherwise, if I have to bring my laptop because I'm typing a paper, it's like, "Okay, it's break time." Checking Facebook is almost kind of a reward for me.*

Another occupational program student explained:

*I can no longer study in my dorm room; it's just too distracting with all the different technology I could have running, so I force myself to go to a study room here in the library where there's nothing but four walls, no technology is available—and that means no Facebook because that's the worst distraction around.*

At the same time, however, the library was not always a place for contemplation and concentration. Some students we interviewed complained of the growing presence of technology and the distractions that accompany devices that had crept into the library, which was for many a last bastion of quiet and reflection in their lives.

According to a student in business administration:

*The library has become a social place. People are always on their phones talking or texting. People come here to see who's sitting with who, who's talking to who. It can get very loud in here. You have to get those really soundproof headphones.*

All in all, we found the majority of students we interviewed placed value on the library as a place where they felt contemplative and could be productive far more than they valued the library as a vast source of information resources and supportive services.

### Summing Up: Part One

In Part One, we presented findings about what students were doing while they were in the library during the final weeks of the term, including their use of technology.

We found more students in our sample had checked for messages more than any other task they had done in the previous hour. At the same time, we found few respondents said they had used the collection of resources and services libraries provide during the same time frame.

The large majority of students who had checked for messages had also been carrying out coursework during the previous hour. Our findings suggest that checking for messages is a complementary task interspersed between the course-related tasks students are under a tight deadline to complete.

In our post-interview discussions with respondents, we found checking Facebook and staying in touch was often paired with carrying out coursework. In many cases, checking Facebook was used as a well-earned reward from the cognitive intensity some students said they experienced when studying in the final weeks of the term.

Lastly, we found in our discussions with students that even though students may have said they were checking messages on Facebook, hacking out problem sets, and/or printing out a paper in the course of the previous hour in the library, the library setting did have an additional purpose.

**...checking for messages is a complementary task interspersed between course-related tasks students are under a tight deadline to complete.**

For many of the students in our post-interview discussions, the library was a refuge, a place where students could dial down the technology that was otherwise omnipresent in their lives. However, a visit to the library did not translate to use of other library resources and services—use of scholarly databases, books, reference services, journals, and other resources was minimal.

### Part Two: Use of IT Devices and Multitasking

*College is about learning how to manage pressure and the deadline, how to categorize, and how to put stress into a small box—sometimes these devices here help with that.*

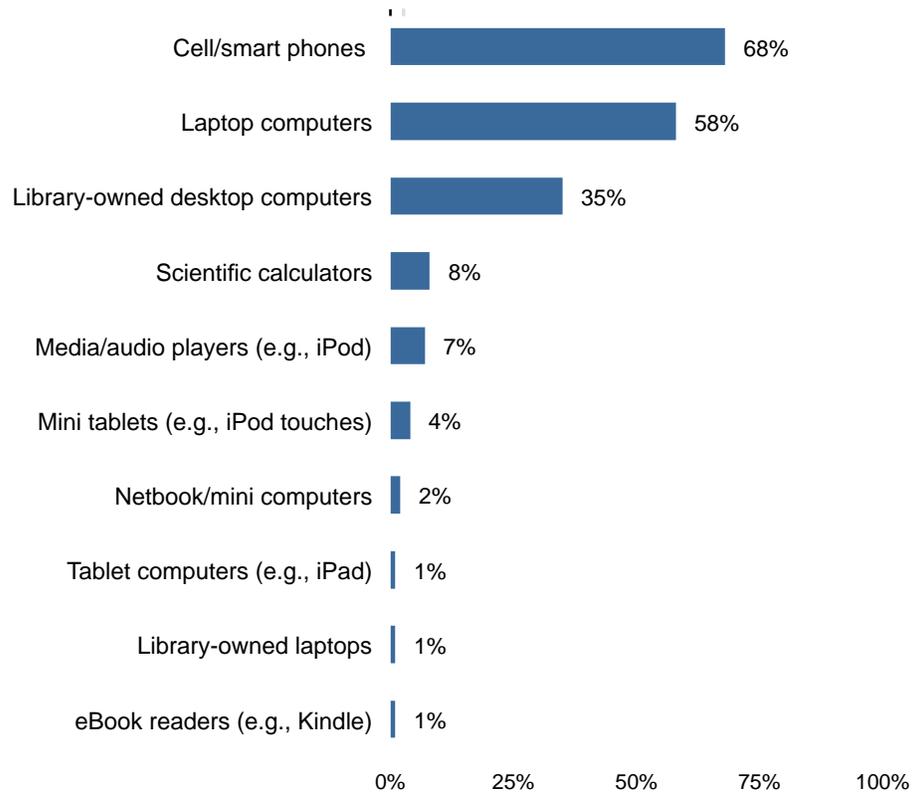
*- Social sciences student in a post-interview discussion*

We now turn our attention to the IT devices we observed students using while they were in the library in the final weeks of the term. What devices were most and least used? What primary activities were being supported with the devices respondents were using?

To answer these questions, we conducted a mini-inventory of the IT devices we observed respondents using at the time of our interviews. We defined devices as *in use* as when an IT device was out in a student’s working area, turned on, and in an interactive state.

We used our inventory as a basis for investigating how students in our sample were using and managing technology while they were in the library. In Figure 7, we present the first part of the analysis—a ranking of information devices from most in use to those least in use. Figure 8 provides the accompanying data details with a breakdown by type of institution.

**Figure 7: IT Devices in Use at the Time of Interviews**



<b>FIGURE 8 DATA DETAILS: IT Devices in Use at the Time of the Interview</b>	<b>Within Four-Year Institutions (n = 413)</b>	<b>Within Community Colleges (n = 147)</b>	<b>Institutional TOTALS (n = 560)</b>
Cell/smart phones	276 67%	107 73%	383 68%
Laptop computers	263 64%	63 43%	326 58%
Library-owned desktop computers	130 31%	64 44%	194 35%
Scientific calculators/computers	37 9%	8 5%	45 8%
Media/audio players (e.g., iPods)	26 6%	13 9%	39 7%
Mini tablets (e.g., iPod touch)	19 5%	2 1%	21 4%
Netbook/mini computers	8 2%	2 1%	10 2%
Tablet computers (e.g., iPads)	4 1%	3 2%	7 1%
Library-owned laptops	0 --	5 3%	5 1%
eBook readers (e.g., Kindle, Nook)	2 --	1 1%	3 1%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges). From most devices to least used IT devices.*

We summarize the findings about what devices we observed students using as follows:

1. The majority of students studied were using IT devices they had brought with them into the library. Over two-thirds of the sample (68%) had their cell/smart phones with them. Most had them turned on.
2. Of the 68% that were using cell/smart phones, those respondents in community colleges (73%) had cell/smart phones turned on more than their counterparts in four-year institutions (67%) at the time of the interviews.
3. Over half the sample (58%) was using laptops in the library at the time of the interviews. Yet, we found when we broke down the data by type of institution, more respondents in four-year schools (64%) were using personally owned laptops than were students in community colleges (43%).
4. Over one-third of the sample (35%) was using a library desktop computer at the time of the interviews. Students in our sample in community colleges (44%) used library-owned desktop

computers more than students in four-year institutions (31%). At the same time, we found far fewer respondents (1%) were using library-owned laptops in either institutional setting.<sup>23</sup>

5. As a whole, few students (8%) were using scientific calculators when we interviewed them. Yet among those respondents who were using calculators, almost twice as many were in four-year institutions (9%) than in community colleges (5%).
6. Fewer respondents (7%) were using media/audio players, such as iPods, at the time of the interviews.
7. More students in our sample in community colleges had media/audio players, including iPods (9%) than in four-year schools (6%).
8. Very few respondents using mini-tablets, such as iPod Touches (4%), tablet computers (1%), such as iPads, and/or eBook readers (e.g., Kindles) (1%).

Overall, if any IT device was the requisite piece of technology for students, it was the cell/smart phone. Almost 70% of the sample was using a cell/smart phone. As one respondent in social sciences commented during an interview, “my cell phone is everything my laptop is not.”

As a student majoring in business administration explained:

*I can't be without my cell phone; it's my portable desk. What would I do if I needed someone's phone number or if I got lost somewhere? I'm holding down three jobs and taking 18 units—my cell phone is my lifeline.*

Moreover, we found the largest gap involved laptop use for respondents in four-year institutions (64%) vs. those attending community colleges (43%). One explanation for this finding is that community college students may not have laptops because of the expense.

Another explanation is that some community college students may have laptops, but since they do not live on campus, transporting a laptop to and from school may be inconvenient. Moreover, these explanations are borne out since more students in community colleges were using library desktop computers (44%) than were students in four-year institutions (31%).

**As one respondent in social sciences commented during an interview, “my cell phone is everything my laptop is not.”**

### **Frequent Combinations: IT Devices**

In a follow-up analysis we asked how IT devices were being used together—concurrently—if at all. In other words, what evidence of multitasking between different IT devices did we observe? In Figure 9, we present the results of our analysis (see the following page).

For the most part, we found that students in our sample who paired their IT devices did so with little variation. The most frequent combination of devices was a cell/smart phone and a laptop (40%). To a lesser extent, other students in the sample were using the combination of a cell/smart phone and a library desktop computer (21%).

<sup>23</sup> Four out of 11 libraries in the sample (36%) made it a practice to loan laptops to students either through the circulation desk or the media center housed in the same building. The remaining seven institutions in the sample (64%) did not have a laptop for loan service available to students.

**Figure 9: What Were the Most Frequent Combinations of IT Devices?**

<b>In Combination: Most Frequently Paired IT Devices</b>	<b>Count and Frequency (n = 560)</b>
Cell/smart phone + laptop	225 40%
Cell/smart phone + library desktop computer	118 21%
Cell/smart phone + media/audio players (e.g., iPod)	37 7%
Cell/smart phone + scientific calculators	27 5%
Cell/smart phone + mini tablets (e.g., iPod touch)	12 2%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges).*

These findings raise a related, underlying question about the reasons students were using devices. When we collected our inventory data, we asked respondents what was the single, most primary activity each device was being used to support: communication, coursework, entertainment, personal research, or scheduling? Which activities were more supported than others while students were in the library during crunch time?

Most respondents said they were primarily using their cell/smart phones (87%) for communication, while over three-quarters of the sample said they were using their laptops (77%) for coursework. Library desktop computers (64%) were also being used for primarily for coursework.

### **IT Device Usage: Coursework over Communication**

As a follow-up to our analysis, we used the data to find out which primary—single most important activity, as a whole—were being more supported by each device respondents were using.

What kinds of major activities were respondent using each IT device to support? The results appear in Figure 10.

Overall, 1,032 activities were being supported by all 10 devices. We found more respondents were using the collective group of devices for coursework (43%) than for communication (36%).

At the same time, very few respondents were using any of the devices primarily to support entertainment, personal research (6%), and or scheduling activities (0%).

**Figure 10: What Primary Activities Were Students Using the Devices to Support?**

IT Device in Use	Communication	Coursework	Entertainment	Personal Research	Scheduling	TOTAL Uses
Cell/smart phones	334 87%	11 3%	18 5%	7 3%	13 2%	383 100%
Laptop computers	16 5%	250 77%	22 7%	36 11%	2 1%	326 100%
Library-owned desktop computers	16 8%	125 64%	16 8%	37 19%	0 --	194 100%
Scientific calculators	0 --	45 100%	0 --	0 --	0 --	45 100%
Media/audio players	0 --	0 --	39 100%	0 --	0 --	39 100%
Mini tablets (e.g., iPod touches)	3 14%	0 --	18 86%	0 --	0 --	21 100%
Netbooks/Mini computers	1 10%	8 80%	0 --	1 10%	0 --	10 100%
Tablet computers (e.g., iPads)	0 --	4 57%	2 29%	1 14%	0 --	7 100%
Library-owned laptops	1 --	4 100%	0 --	0 --	0 --	4 100%
eBook readers (e.g., Kindles)	0 --	1 33%	0 --	2 67%	0 --	3 100%

*Total n =560 students (n=413 in four-year institutions and 147 in community colleges). In this table, the percentages for each activity are calculated using the total uses of each individual device as the denominator (e.g., cell phones and 383 uses is used as the denominator).*

Taken together, these findings suggest that the students in our sample were using a collection of different devices primarily to support coursework far more than they use them for leisure activities while they had been in the library over a period of time during the final weeks of the term.

### Studying with Mobile Apps

During our post-interview discussions with respondents, we found that in addition to communication, cell/smart phones had been used for supporting other coursework tasks throughout the duration of the current term. Some respondents discussed building tools on their other devices they could then transfer to their mobile devices.

One student, majoring in arts and humanities, described using her laptop and a Web site called *StudyBlue.com* to create flashcards and send to her smart phone for use there. Other students used an MP3 player feature on the cell/smart phone to study.

As one student in the sciences said:

*Sometimes I record myself going through the notes from the class out loud and then I play it back later on my phone and keep listening to it throughout the day and it helps me to hear it over again.*

Still, another student studying social sciences in a community college explained:

*I like math a lot. I am taking a class in discrete mathematics, but I can't afford the textbook, so I take photos of the problems sets from reserve books I find for the class through the library. And then when I take the bus to and from school I can just use my camera to study and work on the problem sets, too.*

The comments students shared in post-interview discussions provide some context about the studying practices students are using with their relatively standard IT devices. These workarounds often appear to be innovated on the fly by students and used wherever they happen to be studying.

## A Typology of Technology Users

As a final step, we created a typology that classified different types of technology users in our sample, based on their use of IT devices. In general, typologies are useful to social scientists for summarizing how two or more variables may be systematically combined to create a set of categories, or types.<sup>24</sup>

We asked how many of the students in our sample could be classified as avid technology users, with more than two devices running at the same time for performing more than two primary activities?

Our typology classified the respondents as *heavy* or *light technology users*. We based our categories on two aspects of technology use: (1) the number of IT devices we observed students in our sample having in use, and (2) the number of primary activities students said they were sequentially involved in over the short run to meet different goals at the time of our interviews.<sup>25</sup>

Our analysis resulted in four types of technology users. Type 1 were the "light" technology users. We observed these technology users using one or two devices for supporting just one or two kinds of primary activities at the time we interviewed them in the library. For example, a light technology user may have been using a laptop primarily to support coursework and a smart phone to primarily support communication.

Type 2 were the "heavy" technology users. We observed these respondents using "many devices" (i.e., three or more) and who were also involved in many kinds of activities at the time of our interview. We present the typology and classification results in Figure 11.<sup>26</sup>

<sup>24</sup> E. Babbie (2001). *The Practice of Social Research*, 9<sup>th</sup> ed. Wadsworth, p. 171.

<sup>25</sup> For further clarification, our technology use typology is based on two variables: (1) a count of the different types of IT devices respondents were using, and (2) a count of the different kinds of activities respondents said they were using the IT devices to support. We dichotomized the totals for each measure by mode (2.0 was the cutoff). Our original analysis plan also included a category for how many devices overall respondents were using (e.g., cases where a respondent was using three cell phones and one laptop would be counted as four incidences even though there are only two types of devices). However, we ended up not using the number category since we only had one case where the same respondent was using more than one of the same types of device (i.e., two cell/smart phones).

<sup>26</sup> In our analysis, we counted how many types of IT devices respondents were using and then cross-tabulated the results with the number of different kinds of primary activities (i.e., communication, coursework, entertainment, personal research, and scheduling) respondents reported they were doing with each device.

**Figure 11: Typology of Technology Users**

	Few Kinds of Primary Activities	Many Kinds of Primary Activities
Few Types of IT Devices	Type 1: 477 85%	Type 2: 0 --
Many Types of IT Devices	Type 3: 37 7%	Type 4: 46 8%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges).*

The vast majority, (85%) of the 560 respondents could be characterized as light technology users. Only 8% were heavy technology users by our definitions. These findings, of course, suggest that there were far more respondents in our study who were using few devices (i.e., 1 or 2 IT devices) to carry out one or two primary activities.

In a follow-up analysis using cross tabulations, there were some notable differences to be seen among majors.<sup>27</sup> These ranged from a high of 95% light technology users among students majoring in arts and humanities to a low of 67% light technology users among students majoring in architecture and engineering. Those in the social sciences were about in the middle of this distribution; 85% of them could be characterized as light technology users.

In other words, almost all of respondents (95%) who were majoring in the arts and humanities were using “a few devices” to carry out “a few primary activities”—more than any other area of disciplinary study in our sample. This finding has a plausible explanation. Students in the arts and humanities may be in reading- and writing-intensive majors that are less dependent on technology than are majors in the sciences, architecture and engineering.

The distribution of heavy technology users likewise varied across disciplines. Sixteen percent (16%) of the architecture and engineering majors had what we have called heavy technology usage behavior while only 4% of those in the arts and humanities majors did so and, again respondents in the social sciences, 8%, were about in the middle of this distribution.

One explanation for this finding is that more than other majors, architecture and engineering students may be working out problem sets and using scientific calculators along with the requisite cell/smart phone and laptop.

<sup>27</sup> The null hypothesis in this analysis states that there is *no* difference to be observed among the proportion of a specific typology within one major when compared to another major. Testing at a 0.05 probability, we can reject the null hypothesis in our analysis. From the chi-square goodness-of-fit test results, we found the statistical evidence that major influences technology usage,  $\chi^2 (14, n = 560) = 31.259, p < .05$ . That is, technology use is statistically different from one major vs. another.

During our analysis, we asked how the respondents could be described as far as their GPA and the type of institution they were attending.<sup>28</sup> In both of these analyses, GPA and the type of institution a respondent was enrolled in—four-year or a community college—had little bearing on whether he or she was a light and/or heavy technology user.

As a whole, the findings suggest that most students (especially those in humanities or social sciences)—no matter where they are enrolled—may be light technology users employing one or two auxiliary devices to support one or two primary devices. Moreover, these findings suggest that most students may be taking a minimalist approach to managing their technology while in the library at crunch time.

Most students use a few devices while carrying out a few key kinds of primary tasks. In our follow-up discussions, students described ratcheting down the technology they chose to use. They also discussed, in greater detail, their strategy for using and managing technology while in the library during crunch time.

### **Student Discussions: Less May Be More**

Many of the students in our post-interview discussions described how they winnowed down the number of IT devices they owned or had borrowed and were using in the library at the time we interviewed them. Sometimes students were trying to save money; other times fewer devices were used out of convenience.

As one student in an occupational program said:

*I don't have a lot of devices, just this mini computer that I bought two weeks ago because it was cheaper than fixing my PC. This device is all I need. It will get me through this program.*

According to a student in the sciences:

*I keep all of my class notes on my Kindle. And I buy all of my textbooks for the Kindle, too, if they are available. That way, it's all in one place, always there, and easy to use.*

In other cases, students discussed the methods they had devised for selecting and consciously compartmentalizing the technology they used. Students in our post-interview discussions described these systems as coupled with their goals of working more efficiently, saving time, and controlling competing communication uses.

When some students described their techniques for managing different devices they did so as matter-of-fact solutions derived from highly individualized needs.

A student in social sciences with four email accounts, who sent an average of 150 texts a day, described matching messages with what she considered the best communication channel at her disposal in the following account.

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<sup>28</sup> Mode is the value indicating the most frequently occurring responses from the sample for each research question asked. In this case, we used the modal value to describe who the multitaskers in the sample were by major, year of study, type of institution, and GPA. Our approach to this analysis is purely descriptive.

*I use the urgency of a message I'm sending to decide which technology works best. So, say I need something like a copy of my birth certificate right away, I'll text my mother to scan and send it. If I want to catch up with high school friends, I Facebook them and expect to hear in two days, and if it's something I need to ask a professor and I have three or more days, I'll just use my campus email account. I rarely use the phone, only to talk to my father. But then he wants a whole conversation about my entire life. There's so much social decorum with the phone and phone calls—I just avoid phoning anyone, in general.*

A student in social sciences also explained:

*I'm using the phone for email so I can keep email off my computer. I ended up getting a massive virus on my computer from email, so I got this smartphone, this EVO. This phone was really expensive, I paid a lot of money for it. But it's a convenience. I'm multitasking right now. I'm waiting for a text while I do coursework, if I get an email it will beep. I have a lot of contacts. I coach a group of girls. The cell phone is a convenience plus security plus speed. It's faster to get my email via the cell than the computer. On the computer I have to log on. And the wireless is slower than the 3G.*

For some science and architecture and engineering students, technology—and the temptation of using different devices—had permeated almost every corner of their lives. Ultimately, the best method for managing technology and getting coursework done for these kinds of students was to leverage good old-fashioned deadline pressure. In this situation, there is little flexibility and no time to waste, whether students are using one, two, or three devices at a time.

According to an engineering student:

*Technology hinders learning—it distracts, it changes the sense of time—so I am most productive when there seems to be little time left to meet my goal, like 2 a.m. the night before the paper is due. If I'm not rushed, there's just too many ways to multitask and stop doing what you need to get done.*

All in all, students' comments in post-interview discussions had a common thread. Nearly all of the students described their techniques for managing technology as being practical necessities they needed to function in a technology-saturated world.

The majority of the students in our discussions described two main strategies for reining in and using devices. One was limiting themselves to the one or two devices they needed to get through a term and finals week.

A second strategy was compartmentalized technology and defining use based on very specific needs and circumstances. For example, when it came to using technology for communication sometimes email was the best fit (e.g., communication with professors) and in other cases, it was text and/or Facebook (e.g., friends).

**Nearly all of the students described their techniques for managing technology as being practical necessities...**

## Summing Up: Part Two

In Part Two, we have presented our analysis of IT device usage while students in our sample were in the library during the final weeks of the term. The majority of students in the library population in our study were technology users.<sup>29</sup>

However, we further found most respondents were using a combination of cell/smart phones and a personally owned laptop more than any other devices. And most respondents were using all of their IT devices primarily for supporting coursework and secondarily for communication.

A typology we created with our inventory data indicated that very large majority of respondents—almost 9 out of 10—were light technology users. More respondents studying in the arts and humanities were light technology users than other majors.

In contrast, less than 1 respondent in 10 could be classified as a heavy technology user in our typology. Some respondents were using more than two IT devices to complete more than two primary activities. More of the heavy technology users in our sample were studying architecture and engineering.

Overall, these findings and our post-interview interviews, suggest that students deliberately reduce the number of IT devices they use while they are in the library during crunch time. Moreover, students in our in-depth discussions explained self-styled, practical techniques they used to rein in and compartmentalize the few devices they had in use at the time of our interviews.

## Part Three: Individualized Information Spaces

*Say, I wanted to learn more about the plasticity of a beam, I'll listen to the professor's lecture, I'll read the textbook section but here's what is different I will also watch a 45-minute lecture on YouTube by some professor at MIT talking about materials behavior and plasticity. This gives me the edge and it's how I excel in my classes. I may be enrolled here—but I just sat through a lecture at MIT.*

*- Engineering student in a post-interview discussion*

So far, we have presented findings about the use of devices in the context of the library setting during the final weeks of the term. We focused on what students were doing in the library, including what and how many IT devices were involved in carrying out these tasks. Moreover, we found a large majority of students we interviewed were light—not heavy—technology users in terms of the number of devices they were using to support their primary activities.

At this point in our inquiry, there is a central question in our study that still remains unexplored: What did respondents have running on their devices in the library during crunch time?

In this last section on our findings, we turn our attention to the “individualized information spaces” that students created on their primary IT devices. We define *individualized information spaces* as the media—Web sites and/or applications—students had open and running at the time of the interviews in the library and that they were using to support a range of information-seeking activities.

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<sup>29</sup> In the Approach section of this report, we estimate that 85% to 90% of the entire library population was technology users, that is, almost all students in our study were using some kind of IT device at the time of our interviews.

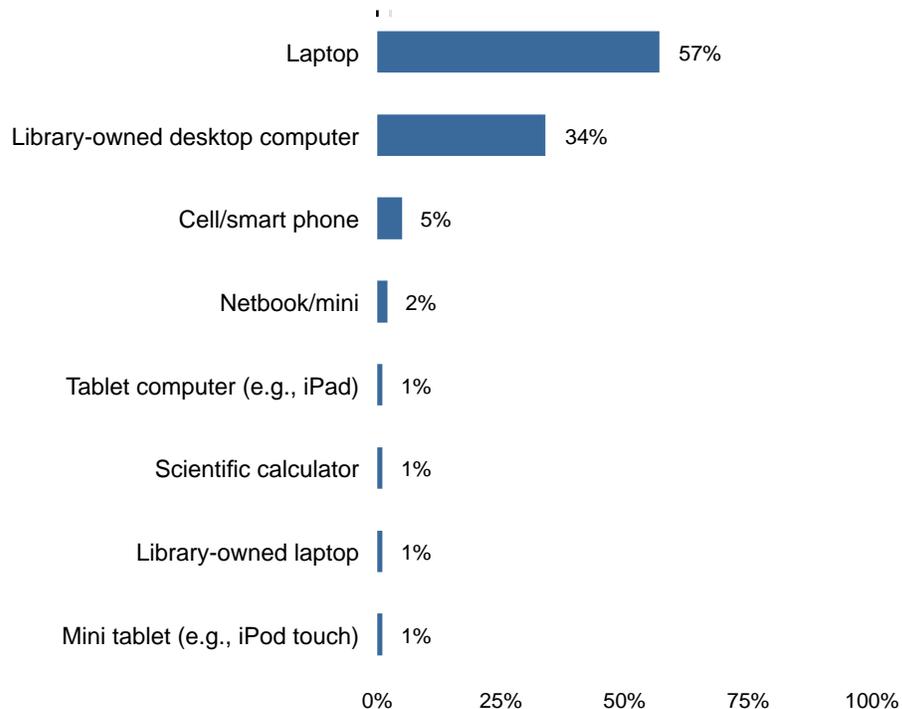
Our prior, preliminary research suggested that students build and create individualized information spaces in order to study, research, learn, produce, play, and/or communicate.<sup>30</sup> Yet, these preliminary findings told us only so much about how students use technology to create these information support systems. In this study, we asked more questions and used a larger sample for finding answers.

What devices and applications do students use for building individualized information spaces? Ultimately, how do students use these technology-facilitated individualized information spaces to find and apply information in new ways of studying and learning?

We used three related analyses to investigate these questions: (1) an analysis of which IT device students in our sample considered their most essential and primary IT devices, (2) the applications they had running on these primary devices, and (3) specifically, the Web sites that made up their individual information spaces.

In Figure 12, we present the results of what respondents said was their primary—indispensable—IT device at the time of our interview.<sup>31</sup> The bar chart ranks the results. In Figure 13, an accompanying data details chart breaks down the results by four- and two-year institutions.

**Figure 12: Which IT Device Is the Primary Device?**



<sup>30</sup> For more details about findings from our preliminary research about individualized information spaces, see footnote 7 of this report.

<sup>31</sup> Our sample size is down from 560 to 553 in this analysis. We excluded seven respondents (1%) since they reported that none of their IT devices was their primary device. Instead, they consider the textbook their primary device.

<b>FIGURE 13 DATA DETAILS: Primary IT Devices</b>	<b>Within Four-Year Institutions (n = 409)</b>	<b>Within Community Colleges (n = 144)</b>	<b>Institutional TOTALS (n = 553)</b>
Laptop computer	250 61%	64 44%	314 57%
Library-owned desktop computer	124 30%	62 43%	186 34%
Cell/smart phone	17 4%	9 6%	26 5%
Netbook/mini computer	8 2%	2 1%	10 2%
Tablet computer (e.g., iPad)	4 1%	2 1%	6 1%
Scientific calculators/computer	6 1%	0 --	6 1%
Library-owned laptop	0 --	4 3%	4 1%
Mini tablets (e.g., iPod touch)	2 1%	1 --	3 1%

*Total n = 553 students (n = 409 in four-year institutions and n = 144 in community colleges). None of the respondents reported eBook readers or MP3 players as their primary IT devices.*

We summarize the findings about primary IT devices as follows:

1. The majority of students in our sample (57%) said their "personally owned laptop" was their primary device for what they were doing at the time of our interviews.
2. In a further breakdown by type of institution, more students in four-year institutions (61%) than in community colleges (44%) reported that their primary device was a laptop.
3. One-third of the respondents interviewed claimed that a library-owned desktop (34%) was their primary device at the time the interviews were occurring.
4. More respondents in community colleges (43%) reported the library desktops were their essential device for what they were doing than students in four-year institutions (30%).
5. Few of the students in the sample considered cell/smart phones (5%), mini tablets/iPod touches (1%), or netbook/mini computers (2%) their primary devices. Far fewer said they considered tablet computers (1%), scientific calculators (1%), and/or library-owned laptops (1%) as their primary device.

Taken together (four-year and community college students), a majority of students (57%) said their primary device was a laptop at the time we interviewed them. However, respondents from community colleges were almost equally divided between whether they considered their primary device a laptop (44%) or a library-desktop computer (43%).

This finding reveals more of the differences between community college and four-year college and university students. Specifically, the finding suggests community college students may rely on libraries for the essential devices they use during crunch time more than students in four-year institutions.

At the same time, we point to how few respondents (5%) reported that cell/smart phones were their primary IT devices for what they were doing at the time of the interview in the library. In Part Two of our detailed findings, we reported that 68% of the sample had a cell/smart phone with them at the time of the interview (see Figure 7).

Yet, the results of Figure 10 suggest respondents—at the time of our interviews—were also using cell/smart phones as ancillary—not primary—devices while they were in library during crunch time.

One explanation for this finding may be that cell/smart phones are convenient for checking messages but not for writing papers and/or reviewing Web sites, given the small size of the screens and/or lack of compatible applications.

### **Applications: Up and Running**

As the next step in our analysis, we took a “macro view” of the general types of applications students had running on their primary devices at the time of our interviews.<sup>32</sup>

Which applications did students have open and running that made up their individualized information spaces?

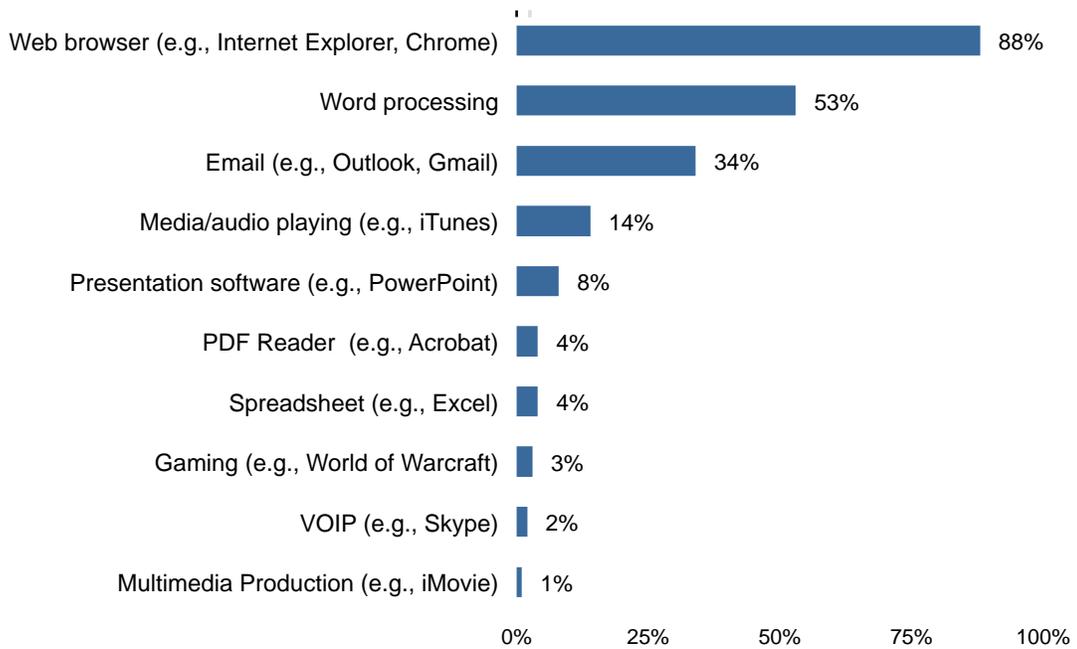
Figure 14 ranks the programs students had open and running on their primary devices.<sup>33</sup> Figure 15 presents provides the accompanying data details with a breakdown by type of institution.

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<sup>32</sup> We collected our inventory about the applications that respondents were using, but not the programs. Applications are designed to interact with a user and therefore, have a user interface (Web browser). A program is an executable code that performs some kind of function (e.g., operating system).

<sup>33</sup> In Question 6, respondents were asked if they could show us what applications they had open on their primary device at that point in time. We define an opened application as one that is “in use” when it is an interactive state (i.e., on the task bar or open on computer screen) and/or capable of receiving and notifying an individual of an incoming message (i.e., a cell/smart phone screen).

**Figure 14: Applications Open on Primary IT Device**



<b>FIGURE 15 DATA DETAILS: Applications Open on Primary Device</b>	<b>Within Four-Year Institutions (n = 409)</b>	<b>Within Community Colleges (n = 144)</b>	<b>Institutional TOTALS (n = 553)</b>
Web browser (e.g., Internet Explorer, Chrome)	363 89%	125 87%	488 88%
Word processing (e.g., MS Word)	225 55%	69 48%	294 53%
Email (e.g., Outlook, Gmail)	138 34%	50 35%	188 34%
Media/audio playing (e.g., iTunes)	67 16%	8 6%	75 14%
Presentation software (e.g., PowerPoint)	37 9%	8 6%	45 8%
PDF Reader (e.g., Acrobat)	21 5%	3 2%	23 4%
Spreadsheet (e.g., Excel)	20 5%	2 1%	22 4%
Gaming (e.g., World of Warcraft)	11 3%	8 6%	19 3%
VOIP (e.g., Skype)	12 3%	0 --	12 2%
Multimedia Production (e.g., iMovie)	3 1%	1 1%	4 1%

Total n = 553 students (n = 413 in four-year institutions and n = 147 in community colleges).

We summarize the findings about the application that the students in our sampling were using as follows:

1. Nearly all of the students in our sample (88%) had Web browsers running on their primary device. A smaller majority of students (53%) were running a word processing program and to a lesser extent, email (34%).
2. Few students in the sample (13%) were using media/audio playing applications, presentation software (e.g., PowerPoint) (8%) or a PDF reader (4%) on their primary devices.
3. Far more respondents in four-year institutions were using media audio players (16%) than in community colleges (6%).
4. Even fewer respondents were using spreadsheets (4%), gaming applications (3%), VOIP applications (e.g., Skype) (2%), and/or multimedia production applications (1%) on any of their primary devices.

Taken together, at the time of the interviews, these findings indicate that most of the students we observed were using a relatively small set of applications. As a follow-up step, we explored how much of an overlap there was between the use of these different applications.

That is, did students frequently have more than one of these applications open at the same time? Were respondents who were using Web browsers also using word processors and other applications when we interviewed them? In Figure 16, we present the findings from this follow-up analysis. We used cross tabulations to find what percentage of students were using Web browsers while using other applications.

**Figure 16: Use of Web Browsers with Other Applications**

In Combination: Web Browsers + Other Applications	Count and Frequency (n = 553)
Web browser + word processing (e.g., MS Word)	260 47%
Web browser + email (e.g., Outlook, Gmail)	177 32%
Web browser + media/audio playing application (e.g., iTunes)	68 12%
Web browser + presentation software (e.g., PowerPoint)	42 8%
Web browser + spreadsheet (e.g., Excel)	18 3%
Web browser + PDF reader (e.g., Acrobat)	16 3%
Web browser + gaming application (e.g., World of Warcraft)	13 2%

*Total n = 553. VOIP/Skype does not appear in this list since it is a Web-based application.*

Overall, these findings provide a glimpse into the individualized information spaces that respondents had created on their primary devices. Most notably, we found 47% of the sample—almost half—had an information space where a word processing program was running in combination with a Web browser.<sup>34</sup>

In other cases, about one-third of the sample (32%) was using a Web browser with a personal email account. Further, a relatively small number of respondents were using Web browsers in combination with applications of leisure, such as a media/audio application (12%) or a gaming application (2%).

These findings also support what we found in our previous analysis: a majority of respondents was preparing assignments for submission (e.g., using a word processing program to write a paper) and also keeping in touch (e.g., checking Facebook or email) while they were in the library during crunch time.

### **Web Worlds**

Given the almost limitless number of Web sites students could access using a Web browser, and given that nearly 9 out of 10 of the respondents had a browser open on their primary device at the time of our interviews, we asked the logical question: what websites were open and in use?

At the time of our interviews, we inventoried the Web sites that the respondents had running on the device that they considered their primary—most essential—device for what they were doing at that point in time.

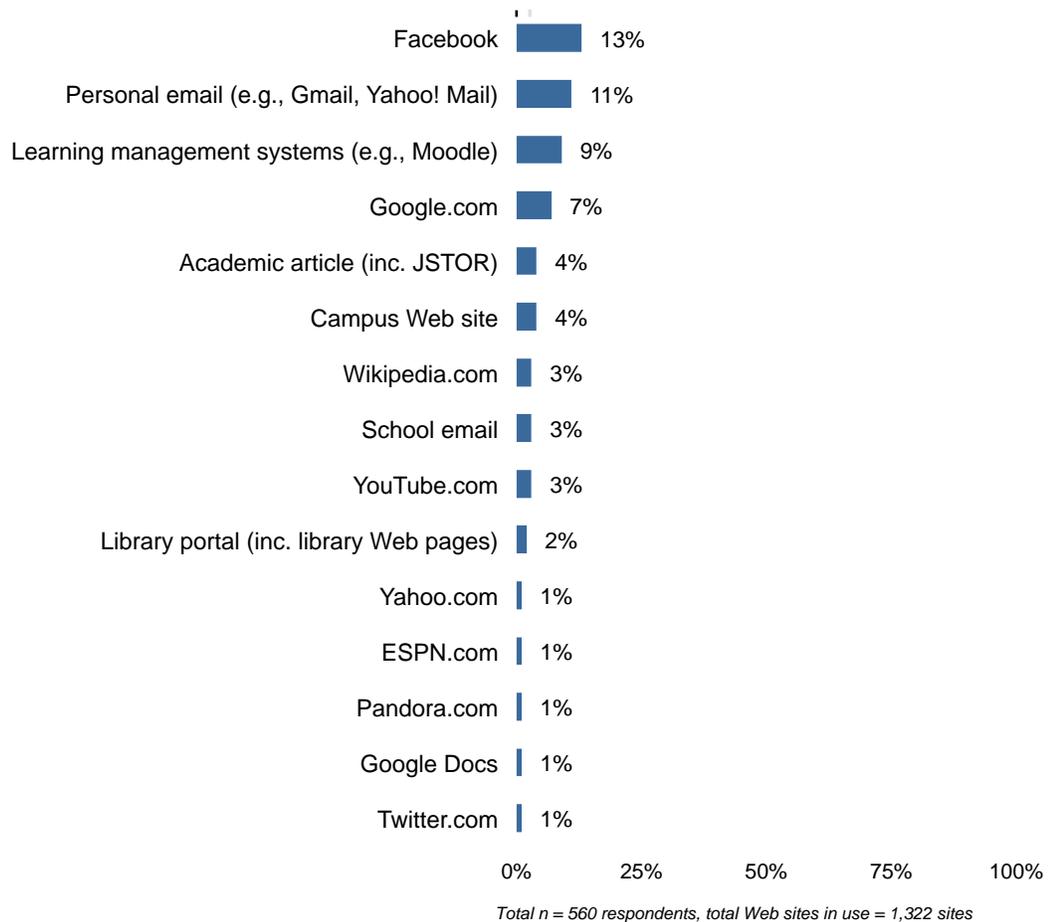
Which Web sites did respondents have open and running while they were in the library at the time of our interview? What kinds of primary activities were respondents using the sites to support? In a larger sense, how were the students we interviewed using the sites to support their information and course-related research needs throughout the term?

To answer these questions, we created an inventory of Web sites that the students were running at the time of our interviews. Collectively, we found that respondents were using 1,322 different Web sites while they were in the library. In Figure 17 we rank the 15 Web sites that the respondents were using the most.<sup>35</sup>

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<sup>34</sup> Accordingly, when we checked the *mode* for the interview question, we found more respondents had been using Web browsers and/or word processing programs than had not.

<sup>35</sup> A list with the top 15 sites in use is provided in Figure 13, since the remaining list of sites in use represents less than 1% of the total sites in use ( $n = 1,322$  sites in use).

**Figure 17: Top Web Sites Students Were Using**

We were surprised by these results; not that Facebook was used more than any other site, but that the students at the 10 institutions were not using even more of the same collection of Web sites at the time of the interviews.

In fact, the findings suggest that college students create highly individualized information spaces when using the campus library during crunch time. Notably, the same sites were used by a very small percentage of the sample.

The largest percentages of the students in our sample were using Facebook (13%), personal email (e.g., Gmail, Yahoo! Mail) (11%), learning management systems (e.g., Moodle) (9%), and/or Google (7%).

As a follow-up to this analysis, we explored how respondents were using the sites at the time of the interviews. Overall, we asked students in our sample whether they were using the Web sites to primarily support one of these activities: communication, coursework, entertainment, personal research, or scheduling. The results our analysis of the top 15 sites appear in Figure 18.

**Figure 18: What Primary Activities Were Students Using the Top Web Sites to Support?**

Web Sites In Use	Communication	Coursework	Entertainment	Personal Research	Scheduling	TOTAL Uses
1. Facebook.com	68 39%	3 2%	78 45%	25 14%	1 1%	175 100%
2. Personal email (e.g. Gmail)	104 71%	33 22%	0 --	9 6%	1 1%	147 100%
3. Learning Mgt. Systems (e.g., Moodle)	0 --	117 99%	0 --	0 --	1 1%	118 100%
4. Google.com	1 1%	71 82%	0 --	15 17%	0 --	87 100%
5. Academic articles	0 --	49 98%	0 --	1 2%	0 --	50 100%
6. Campus Website	11 23%	33 69%	0 --	2 4%	2 4%	48 100%
7. Wikipedia.com	0 --	29 66%	1 2%	14 32%	0 --	44 100%
8. School email	13 35%	23 62%	0 --	1 3%	0 --	37 100%
9. YouTube.com	0 --	5 14%	25 69%	6 17%	0 --	36 100%
10. Library portal	1 4%	24 92%	0 --	1 4%	0 --	26 100%
11. Yahoo.com	2 14%	3 21%	5 36%	4 29%	0 --	14 100%
12. ESPN.com	0 --	0 --	8 62%	5 38%	0 --	13 100%
13. Pandora.com	0 --	1 8%	12 92%	0 --	0 --	13 100%
14. Google Docs	0 --	11 92%	0 --	1 8%	0 --	12 100%
15. Twitter.com	5 56%	0 --	3 33%	1 11%	0 --	9 100%

Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges). From most used to least Web sites. In this table, the percentages for each activity are calculated with the total uses of each Web site as the denominator (e.g., Facebook, 175 total uses).

We summarize the findings about Web sites in use as follows:

1. More than any other Web site, Facebook was up and running on respondents' primary devices (13%) in the library at the time of our interviews.
2. In a breakdown by activity, each site was supporting, far more of the respondents said they were using Facebook for entertainment purposes (45%) rather than communication (39%).
3. Almost 1 student in 10 (9%) had a learning management system (LMS) up and running on his or her primary device. Nearly all of the respondents (99%) reported they were using an LMS for coursework at the time of the interviews.
4. In a breakdown by activity, most respondents (82%) said they were using Google mainly for coursework and/or academic articles (98%).
5. Very few respondents (4%) were using the campus Web site and hardly any (2%) were using the library portal. Yet in both cases, most students in the sample said they were primarily using the campus Web site (69%) and/or the library portal to support coursework (92%) at the time of the interviews.
6. A small minority in the sample was using Wikipedia (3%), YouTube (3%), Pandora (1%), and/or ESPN (1%).
7. In the breakdown by activity, more respondents said they were mainly using Wikipedia for coursework (66%) and more respondents said they were primarily using YouTube (69%), Pandora (92%), and ESPN (62%) for entertainment when we interviewed them.
8. Hardly any respondents (1%) were using the cloud application, Google Docs. Almost all of the respondents who were using Google Docs (92%) said they were using it primarily for coursework at the time of the interviews.

### **Web Use: Coursework over Communication**

In a follow-up step in our analysis, we used the data to find out which types of activities, as a whole, were being more supported than others by the students in our sample.

When it came to the top sites the entire sample was using, what kinds of primary activities were these sites being used to support?

For this analysis we analyzed the total 842 activities being supported by the top 15 Web sites being used. We found respondents were using the top 15 Web sites almost twice as much for coursework (48%) than for communication (25%).

At the same time, few respondents were using any of the top 15 Web sites primarily to support entertainment (16%), personal research (10%), and or scheduling activities (1%).

Taken together, these findings suggest that the students in our sample were using Web sites primarily to support coursework far more than they used them for leisure activities while in the library during the final weeks of the term.

### In Combination: Facebook and with What Other Sites?

As an additional follow-up in our analysis, we focused on Facebook, the Web site used by more respondents than any other site. Was Facebook being used in combination with other Web sites? What pairings of Facebook were respondents using more than others?

These findings led us explore the so-called multitasking behavior of the sample in their use of the Web and specifically, Facebook. In Figure 18, we present the results of the analysis. The percentages represent how many respondents were using Facebook along with another Web site in our list of the 15 Web sites most in use.

**Figure 18: Use of Facebook with Other Web Sites**

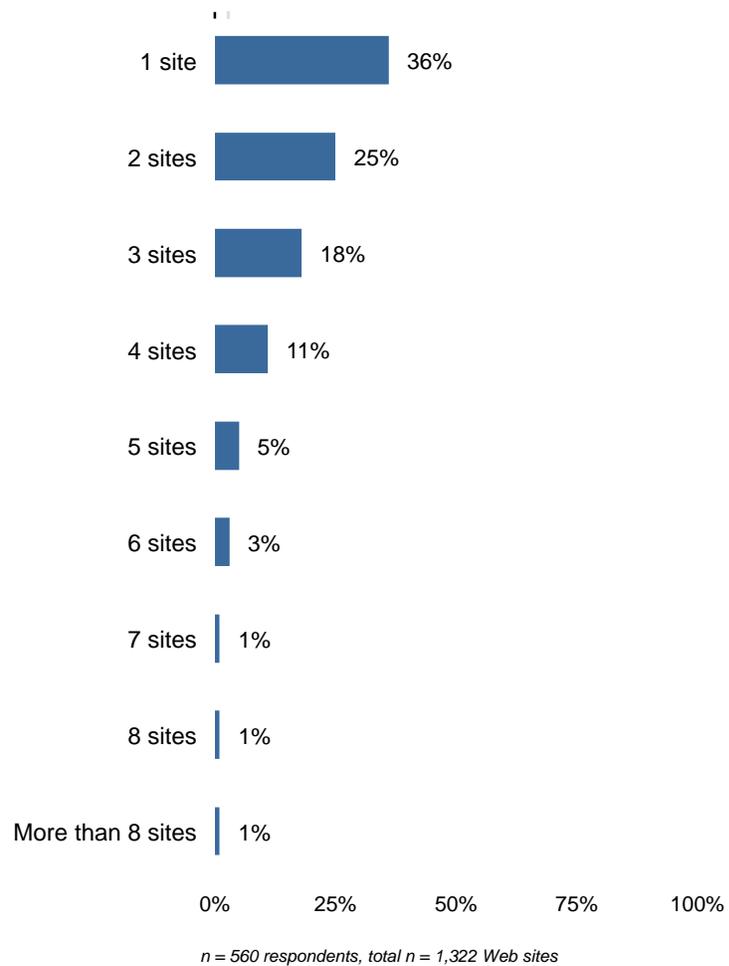
In Combination: Facebook and Other Top Web Sites in Use	Count and Frequency (n = 553)
Facebook + personal email (e.g., Gmail)	50 29%
Facebook + academic article (inc. JSTOR)	26 15%
Facebook + Google.com	25 14%
Facebook + campus Web site	17 10%
Facebook + Wikipedia	16 9%
Facebook + school email	14 8%
Facebook + YouTube.com	14 8%
Facebook + Learning Management System (e.g., Moodle)	7 4%
Facebook + Pandora.com	7 4%
Facebook + Twitter.com	7 4%
Facebook + Yahoo.com	7 4%
Facebook + Google Docs	6 3%
Facebook + library portal	6 3%
Facebook + ESPN.com	4 2%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges).*

We found that more respondents—almost one-third of the sample (29%)—who had Facebook open in their browser also had a personal email account open. Moreover, we found that few students who had Facebook open in their browser had either an academic article (15%), Google.com (14%), and/or Wikipedia (9%) open at the same time.

Our final analysis about respondents’ Web site usage at the time of our interviews may be the most revealing. They tell about the scope of the individualized information spaces students are creating on their primary devices during crunch time while they are in the library. We calculated how many sites—on the average—each respondent was using at the time of our interviews. The results appear in Figure 19.

**Figure 19: How Many Web Sites Did Students Have Open during the Interviews?**



Just about two-thirds of the sample (61%) had only one or two Web sites open on their primary devices when we interviewed them. In a larger sense, these findings suggest that students’ individualized information spaces may be very small, as far as the Web sites they have chosen to use while they are in the library during the final weeks of the term. Here again, the findings suggest that students’ individualized information spaces are just that—highly unique—and that few students have the same top sites running in their browsers while they are in the library during crunch time.

### Usage of Social Media and Coursework

In the last question in our interview, we again concentrated on Facebook and other social media sites. We asked respondents how frequently they had used social media sites, such Facebook, YouTube, Twitter, and online forums, in relation to coursework during the current term. The results are shown in Figure 20.

**Figure 20: How Often Did Students Use Social Media Site During the Term?**

Use of Social Media in Relation to Coursework	Within Four-Year Institutions (n = 413)	Within Community Colleges (n = 147)	Institutional TOTAL (n = 560)
Almost Always	89 22%	11 7%	100 18%
Often	104 26%	16 11%	120 21%
Sometimes	111 27%	32 22%	143 26%
Rarely	63 15%	28 19%	91 19%
Never (i.e., no experience)	46 11%	60 41%	106 19%

*Total n = 560 students (n = 413 in four-year institutions and n = 147 in community colleges).*

Almost two-thirds of interview sample (65%) reported they had some experience using social media as part of working on their course assignments. At the same time, however, few respondents (18%) had “almost always” used social media sites in support of coursework during the current term.<sup>36</sup>

Moreover, when we broke down the responses by type of institution, we found that far more respondents enrolled in four-year institutions (74%) had some experience with using social media and building on user-generated content during the current term than respondents who attended community colleges (40%).<sup>37</sup>

<sup>36</sup> We have conflated the responses for “always,” “often,” and “sometimes” into a single category we have defined as “use” for this analysis.

<sup>37</sup> These figures are based on conflated responses of “almost always,” “often,” and “sometimes” for both four-year colleges and universities (n=413) and community colleges (n=147).

One explanation for this finding may be that the respondents attending four-year institutions are more likely to communicate with classmates using social media, such as Facebook and to a lesser extent, with Twitter, than students in community colleges.

One of the findings previously reported (see Figure 1) lends some support to this explanation. Far more respondents at four-year institutions (85%) were checking for messages while they had been in the library during the previous hour than respondents in community colleges (69%).

In our post-interview discussions, we found that students used social media, such as Facebook, to coordinate meeting times and homework assignments (i.e., due dates) with other students in their courses. There were, however, times when online forums were used for other course-related purposes, especially to study and enhance their learning.

### **Student Discussions: New Learning Practices**

Students in our post-interview discussions described using social media sites in direct relation to completing their coursework in five ways:

- (1) to take a break from the coursework they were completing,<sup>38</sup>
- (2) to coordinate a meeting time or details about an assignment (e.g., due date, length of a paper) with classmates (e.g., sending a Facebook message),
- (3) to learn material through interactive dialogues (e.g., online forums),
- (4) to individually create user-generated content for integrating into their assignments, and
- (5) to study and go beyond the perspective a professor and/or textbook for a course were providing.

The majority of respondents noted some use—no matter how rudimentary—of social media sites, especially Facebook, as a method for completing their coursework and learning the material. Facebook was most frequently mentioned when students discussed using social media sites while working on course assignments.

More students discussed using Facebook to contact fellow students from a class for finding out details of assignments, but also because Facebook was a more socially acceptable means of communication than asking for a phone number.

A student in social sciences said:

*I use Facebook a lot for organizing meetings because you can find people's names, you know they check Facebook, and it is less awkward than asking somebody in your class for their phone number.*

In other cases, respondents had used social media because one of their instructors had integrated a site, such as Facebook, into their course curriculum.

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<sup>38</sup> See this report and the Student Discussions, "Time for a Facebook Break," in Part 1, pp. 11-12.

A student in the sciences said:

*Some of my physics classes have a study group on Facebook, where we get tips, suggestions, help with your problem set. You take a photo of the problem set and your answer you've written out and then post the picture to Facebook.*

In some cases, professors encouraged their students to use the site for collaborating and learning the material from one another. But, according to the students in our post-interview sessions, very few instructors integrated social media into their course curriculum.

A student in the social sciences said:

*It would be useful for teachers to use blogs where they post assignments and the lecture. I had two teachers do that. I can go back anytime and look again when I'm outside of class. Most teachers don't do that. I wish they all did. Last semester, we set up a Facebook page for our group and that was good. I could go back and look.*

At the same time (but to a lesser extent), we found some students tended to be "self-starters." They had found ways to integrate social media into their own learning and studying practices, well beyond what instructors suggested. Many of these students had used Facebook to create user-generated content they could integrate into assignments.

A student in the sciences explained how she was using Facebook at the time of the interview:

*See, I have put my paper topic up on "status," the main headline on my Facebook page. Then, I'm asking my friends what they think. This paper is about whether cheerleading should be a sport or not, and I ask my friends what they think and why and talk about what they have said in the paper I write—I use them as a source in my paper.*

According to a student in an occupational training program:

*Facebook has a new app where you can add an attachment when you send a message to a friend, so now I can send papers for class back and forth with my friends in certain classes. I read their paper, and they read mine. I tell them if it's muddled-sounding and check and fix their paper for spelling, grammar, and so forth. If a topic they have written piques my interest, I'll even go out and do some more research for them, I'll just Google the topic and see what I might find—I've been a bookworm my entire life.*

Another use of social media some respondents discussed using online forums (i.e., beyond those on learning management systems) for reinforcing course material and going beyond what the professor was providing in class and/or office hour exchanges. Students checked forums to gain an edge in the course and learn the material in a far broader context than they could from the professor.

A student in an occupational program explained:

*The class lecture just whets your appetite, so I will search forums through a Google search, and I find out thousands of other people are looking for the same information and answers to questions I have, too. The forum discussions give you different sides and different perspectives from the instructors—even in science where things seem more black and white. There are breakthroughs all of the time. But some professors, they get really nervous if you bring up outside things in class or even on an exam, so you have to learn to be diplomatic and just say, 'Hey, here's another idea, too'—you learn that. Some instructors here they just don't get that there are different perspectives than what they know and are teaching.*

Several students in our post-interview discussions described the benefits of using YouTube, including the visuals and animated effects the videos delivered. But, perhaps, and even more importantly, respondents discussed YouTube's value to them as being one of the fundamental tenets of good learning—repetition and review.

According to a student in social sciences:

*I was struggling with this one class I have to take about blood circulation and how it works in the heart; the instructor went over it in class a couple of times, but I just didn't get it. I thought I'm never going to learn to get this, I'm going to fail. Then I searched on YouTube and I found this great video with a step-by-step explanation of how circulation worked with someone drawing each step and explaining what was going on. I could pause and review each step and really study the new part of the drawing she just did—that's how I learned it, I needed the visuals and I needed to see it over and over again, that's how I ended up passing.*

Another student in an occupational program explained:

*I've been going to YouTube.com and just typing in "reproduction" for this biology class I'm taking now, I do it on my own every day, since what I find reinforces what the professor is showing in class with his PowerPoint slides. I just take a heading from one of his slides, like, this one, see, "male reproductive system," and then I search on YouTube to see if I can find something else, like here, see this animation about male reproduction. There's a lot here, but I always check to see if it's any good before I watch it. I look at how many people clicked that they "liked it" and then I read comments posted about the video and see how long it is. Then, I'll watch it, if it looks good. Time is not so important, five minutes works, but sometimes I watch a video that's an hour long. Then, if I find something on the video that doesn't match with what the professor has said in class, I'll bring it up in class, I'll ask which version he thinks is correct and then we all discuss it—it's how I learn.*

Still other students found a social media site they visited repeatedly and integrated into their learning process. Students in our post-interview discussions most frequently mentioned Khan Academy, a group of over 2,400 mini-lectures (i.e., 5 or 10 minutes in length) posted on YouTube.

Salman "Sal" Khan, a former MIT educator, developed the animated and highly explanatory videos that cover history, mathematics, finance, physics, chemistry, biology, astronomy, computer science, and economics. We discovered that Khan Academy videos had almost a cult following among some students, though we found few librarians and or professors who had heard of the resource.

A student in the sciences explained:

*I use Khan's Academy all of the time on YouTube.com Sal's great, he first made these videos for his grandkids, he's some retired professor, I think. Anyway, there's just this blackboard on the video clip and then Sal shows you how to do equations, or he shows you stuff about chemistry, or biology—it's all there, there's a lot of stuff, and it gives you the material from a different perspective but it ties it all in with your class. If you don't do outside work like this you end up with a C in some class. The classes just lay out the basic stepping-stones and the rest is up to you in college—that is if you're serious and you make it a job, instead of being some slacker.*

Taken as a whole, our discussions uncovered the powerful potential of social media in addition to providing a snapshot about ways in which studying and learning are changing for students in the digital age.

While most students seemed proficient in using social media for coordinating simple course logistics, we found other students had used social media as a research and learning source that went beyond what course curriculum was serving up.

We were struck by some students' growing use of YouTube, not only for entertainment, but also for study through the term. In general, YouTube videos helped certain students grasp complex concepts more easily. Perhaps, most importantly, these students considered being able to stop a video, take some notes, then go back and review and replay it as many times as they liked as something they could never get in a class lecture from a professor when they were struggling to learn material.

### **Summing Up: Part Three**

In Part Three, we presented findings about the individualized information spaces that the students in our sample had created on their primary IT devices—laptops or to a lesser extent, library desktop computers—while they were in the library at the time of our interviews.

Almost 9 out of 10 respondents (85%) had a Web browser open and running, more than any other application. Moreover, almost half of the sample had a Web browser open along with a word processing program.

At the same time, we found very little commonality among respondents in terms of the Web sites, which they were using at the time of our interviews. More than any other site, 13% of the sample had Facebook open and smaller percentages had their personal email (11%) and/or a learning management system, such as Moodle (9%). Beyond this, students in our sample were using a total of 1,322 sites, and in many cases, sites, themselves, were only used by a single respondent.

In our post-interview discussions, we discovered that more respondents in four-year institutions than in community colleges had experience with using social media while working on assignments during the current term. Some students were using sites such as Facebook to generate user-content for papers or online forums and/or YouTube videos for learning beyond what the professor, course curriculum, and textbook could offer.

### **A Preliminary Theory**

Our latest PIL study provides a glimpse of how students are using and managing IT devices in a given setting—the campus library—and under certain circumstances—the last weeks of the term.

These findings are based on data collected from observation and interviews. By using this research approach, we were able to investigate the "hows and whys" of college students' technology use in the library setting.

More than anything else, the large majority of "light" technology users we found in our study sample surprised us. On the surface, these findings belie some of the conventional wisdom about the multitasking generation: always plugged in, always on, always switching among different Web sites, and unable to concentrate on one activity at a time.

Instead, on a deeper level, the results of our study lay the groundwork for a preliminary theory about how students use and prioritize the use of IT devices. We propose that students' strategies for managing technology are complex and may be dependent on certain factors, such as the library, the level of the institution (community colleges or four-year institutions), and certain circumstances, such as the final weeks of the term.

Further, the results of our study lend support, in much a broader sense, when the pressure is most intense students may be consciously decrease the propensity for electronically multitasking (i.e., switching their attention among a different IT devices).

Our interviews suggest that most students use their own sets of self-styled techniques for managing technology that they apply as matter-of-fact necessities in their lives. Further, we inferred that many students intentionally apply these techniques in full force during the final weeks of the term, especially when using the campus library.

As noted earlier, we acknowledge that this preliminary theory is based on a relatively small sample (n=560) of students enrolled at 10 colleges and universities across the US and there are certain methodological limitations to our research. For instance, we have not collected data describing respondents' multitasking behavior in terms of its actual occurrence, that is, how often respondents switched from one device or one activity to the next.

Moreover, we have no data about how these behaviors may occur outside of the library or after the final weeks of the term, although this would provide a useful basis of comparison. Nor have we included data that would give a full accounting of students' media multitasking behaviors, including the use of print materials (e.g., textbooks, reserve readings), for supporting any and all types of activities other than primary ones.

For these reasons, our study should be considered exploratory and also useful for identifying certain questions for future research. One area of research that would add to our discussion is studying the variability of students' technology use and multitasking in different settings (e.g., dormitories, coffee shops) and circumstances (e.g., first few weeks of class). In-depth student diaries and/or eye-tracking studies may present other methodological options, thereby adding depth and richness to the data collected.

Depending on these new findings, of course, the data may confirm the conclusions of this study: that today's students very consciously manage the technology they use with a set of self-styled strategies and techniques. Moreover, it may reveal that students' decisions for compartmentalizing technology and the applications are driven by factors that include locale and circumstance, more so than purely reflexive behaviors, which gives the illusion that technology use and multitasking are taking place everywhere and under all circumstances and with little variability.

## Conclusion

Since 2008, the topic of technology has been a fundamental component of our ongoing research at Project Information Literacy (PIL). In this latest study, we set out to understand how students, who were in the library in the final weeks of the term, managed and used technology when the pressure was at its most intense. We conducted 560 interviews with undergraduates who were enrolled at 10 different US colleges and universities.

We also investigated the highly individualized information spaces that the students in our sample created on their IT devices. We studied the ways in which these spaces afforded students’ new learning and studying practices in the digital age.

Overall, we were surprised by what we found. In the broadest sense, our findings led us to conclude that what the media has dubbed the “multitasking generation” surely exists, but it may not be as fractured or haphazard in its working habits as we have been led to believe.<sup>39</sup> That is, our findings suggest this moniker, in general, may not always apply in some locales and under certain circumstances.

Based on our interviews with college students, who were a couple of weeks away from final exams and in 11 library settings, we found most students have well-established routines that are designed to limit distractions, so they may be able to concentrate and focus.

Nowhere was the evidence about students’ use of technology more apparent than in the results from our technology user typology. We found very few of the respondents could be classified as *heavy technology users*—that is, juggling more than two IT devices to support more than two primary activities at the time we interviewed them in the library.

Instead, and in stark contrast, a very large majority—almost 9 out of 10 of the respondents—were *light technology users*. Light technology users were respondents who were using one or two IT devices to most often support the activities of coursework, and to a lesser extent, social communication.

Moreover, we discovered that most of the students we studied had self-styled techniques they judiciously applied for dialing down the technology they were using during crunch time.

Though specific practices varied among respondents, a common thread ran through our interview results: most students talked about a need to winnow down technology and appeared to be carefully compartmentalize the devices they used, in an effort to exert some control over the temptations technology may bring on during the final weeks of the term.

These commonalities enrich our understanding of how many of today’s college students may be managing the technology in the library—the smart phones, the laptops, the iPods, library-owned desktop machines—and all the rest. Further, the findings tell us far more about how today’s students have come to use the library at crunch time and why.

**...what the media has dubbed the “multitasking generation” surely exists, but it may not be as fractured or haphazard in its working habits as we have been led to believe.**

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<sup>39</sup> See *Time Magazine*’s March 2008 cover story by C. Wallis, “GenM: Multitasking Generation,” where the author leads with: “they’re e-mailing, IMing, and downloading while writing the history essay. What is all the digital juggling doing to kids’ brains and their family life?” from <http://www.time.com/time/magazine/article/0,9171,1174696,00.html>, (accessed August 26, 2011).

## Self-Styled Techniques

One of students’ most widespread techniques for managing technology was their use of the campus library itself. Most respondents in our sample said they had used few or none of the library resources and services available to them while they had been in the library in the previous hour.

Instead, they beat a path to the library because they valued it as *a place*. These findings suggest students use the library less as a source of reference material and research than as a refuge from the social distractions brought on by all of the technology that has become a seamless part of most of their lives. Further, the library was a place students in our sample relied on for equipment, such as desktop computers and printers, especially students in community colleges.

Another technique students employed for managing technology involved *self-incentivizing*, as economists like to say. We found Facebook may be an incentive—the carrot—that among other things helps many students get their coursework and assignments done while they are in the library at crunch time.

In our study, even though far more respondents—8 in 10—said they had “checked for messages” while they were in the library using different IT devices, we still found a majority of students also reported they had been preparing assignments for submission and/or studying during the previous hour.

On one level, these findings indicate that “checking for messages” may complement course-related tasks. However, a deeper explanation of these findings emerged in our qualitative post-interview discussions with respondents.

For many students, “checking for messages” or “taking a Facebook break” – every 15, 30 or 60 minutes – was a well-earned reward from what they described as thinking hard (also referred to as “cognitive drudgery”) that many said they experienced while working on difficult assignments.

Moreover, students told us they stayed online and in close proximity to their work. They did not get up from their seats, ask for help from a librarian, or use most library resources; indeed their most valuable devices run the risk of being stolen if left unattended. Nor do they leave their online worlds, where their most alluring self-incentives are.

How these students approach studying changes the mix of how interactions and communication are occurring in the four walls of most libraries. Ultimately, this approach also changes how libraries are being used and the opportunities that may exist for delivering services and resources.

Whether this is the best strategy for learning, of course, is an entirely different question from our research questions. But what this finding does tell us is that many of the students we studied (on numerous campuses in different geographic regions of the US) were applying similar practices and techniques for balancing productivity with social diversion while they were in the library during crunch time.

Although some of these techniques may vaguely resemble the techniques some readers may have used 20 or 30 years ago when they were in college, and took a break to buy a candy bar or a cup of coffee from the vending machine in the library—we point out that the techniques students are using today are very different.

**For many students, “checking for messages” or “taking a Facebook break” – every 15, 30 or 60 minutes – was a well-earned reward from what they described as thinking hard...**

Today, the potential distraction of IT devices due to many of their “always receiving and always notifying” interactive states make technology something students have to figure out how to confront, manage, and in most cases, temper, especially during crunch time.

Findings from our IT device inventory and their interview discussions have led us to conclude that many college students appear to have adopted a “less is more” approach when the pressure is most intense.

More respondents had a laptop and a cell/smart phone running, but little else at the time of our interviews. Moreover, we found most students—almost 9 out of 10—had a Web browser open but that a majority of the sample was only actively using one or two sites, at most, at the same time.

The individualized information spaces respondents built on their primary devices while they are in the library during crunch time are just that—highly individual, highly personalized, and small in scope.

All in all, these findings further suggest that the so-called multitasking generation may not always be as involved in as many tasks and with many IT devices, as expected. We found few students were jumping from one Web site to the next, sending texts, playing games, and simultaneously jotting down a paragraph here and there for an essay that was due in two hours.

The avid multitasking students in the library surely exist—but our results suggest they may be the exception, not the norm during crunch time. Therefore, we argue that multitasking appears to be a complex behavior that is not as ubiquitous as some may think. Of course, we have no data from our study that could be used to substantiate whether a “less is more” approach to managing technology and multitasking directly benefits learning, or not.<sup>40</sup>

Finally, some of the richest qualitative findings in this study were revealed when we asked respondents about their use of social media in relation to completing coursework. We found a majority of students had used social media during the current semester or quarter for arranging logistics, and to a lesser extent as tools for learning.

Most notably, we interviewed students who we describe as “self-starter students,” based on their innovative uses of social media for studying and learning. These students took the initiative to use a YouTube video to review material they did not understand in a class lecture, so they would excel in—or, in other cases, avoid failing—a class.

Other respondents reported their use of the status update on their Facebook page to collect user-generated content they could integrate into a paper they were writing. Still other students told us about using social media in ways that truly began to democratize the process of learning.

**The avid multitasking students in the library surely exist—but our results suggest they may be the exception, not the norm during crunch time.**

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<sup>40</sup> See PIL’s October 2011 “Smart Talk” interview with Dr. Russell Poldrack, a renowned neuroscientist who uses MRI imaging to study the human brain during multitasking at the University of Texas at Austin for more discussion about dialing down technology and possible cognitive benefits, from <http://projectinfoit.org/st/poldrack.asp> (accessed October 4, 2011).

An engineering student in a post-interview discussion described the potential of using social media for learning as follows:

*I am no longer bound by what the professor gives me in a class and his perspective on something. There are lots of engineering forums that I can just Google. I can ask some question and gets lots of different answers, lots of different perspectives –not just the one from the professor who happens to be teaching my class. Learning different sides to the same question is what what college should be about and all it takes me now to get some of that is an easy search on Google for "forums."*

Overall, we found a new kind of collaborative learning at the grassroots level. This seismic shift toward the use of social media for learning and studying will profoundly change the foundations of pedagogical authority and change learning on multiple levels. We look to self-starter students, sitting at their screens, to comprehend the origins of this change.

## Recommendations

In the final section of our research report, we draw on our findings to make recommendations about different learning opportunities for educators, librarians, and administrators who are serving a new generation of students that has never known a world without personal computers and cell phones.

While these suggestions may not apply to every campus, we hope they will stimulate conversations that may lead to new strategies for helping students who are already researching in profoundly different ways from their predecessors, including the very professors and university staff to whom they are looking for guidance.

We anticipate that these suggestions will also resonate with the producers and publishers of educational materials, from textbook publishers and database providers to the high-tech companies that are developing the tools that students are using for research.

More than anything else, this study, and our ongoing national research, have identified the same gaps that are occurring in very different educational settings. These gaps have profound implications for how libraries and teaching in institutions of higher learning may evolve in the 21<sup>st</sup> century. Readers of all stripes may want to treat the gaps that PIL has discovered as signposts that can serve as a basis for evaluation, improvement, and opportunities on their own campuses.

### ***Recommendation #1: Assessing the library's role as refuge***

We are intrigued by the reasons respondents gave for being drawn to the campus library during the toughest weeks in the term. Despite a paradigm shift to the digital age with all its techno-noise and intrusions—or perhaps because of it—many students are still drawn to the quaint hush of the campus library as well as the equipment (e.g., printers and desktop computers) they provide. Here among books they rarely pull off the shelves, students told us they felt “studious,” “contemplative,” and “productive.” This may be good news for librarians: business is booming.

At the same time, we are deeply concerned by how few respondents said they had availed themselves of many of the library's resources and services. For many students, the real allure of the library is as a place of refuge and not as a direct source of information and support.

We see a widening gap between the old business model under which many libraries are still operating, and the reality of how students are actually using them. Given this finding, we encourage librarians to conduct a systematic examination of the resources and services they provide at crunch time and at other times as well, keeping in mind the changing ways in which students are researching and learning. Without this kind of soul-searching and updating of the library’s traditional mission, we are concerned that these spaces may become less and less relevant to research and learning.

Other studies support our findings that traditional services, such as reference materials and guidance, may be sadly at the highest risk of obsolescence.<sup>41</sup> Simple truth? Most students, even those sitting in the library, do not use its reference resources, either in face-to-face exchanges with librarians or online by using services such as “Ask a Librarian.”

In our study we heard more complaints about the quality of Wi-Fi service or the cost of printing than the long line at the reference desk or books not being on the shelves. The challenge to libraries now is how to meet the needs of students without abdicating their role in disseminating knowledge. How do libraries remain relevant to students beyond providing technological equipment like printers and desktop computers and quiet places to sit?

These are difficult questions to raise let alone answer, at a time when technology is transforming cultural practices at warp speed. We recommend that libraries, if they have not begun doing so already, to identify the gaps between the services that they offer and what services students actually need and would find useful in an increasingly digital world. One way to start this kind of analysis is by working with faculty and other key stakeholders on a campus-wide survey of students’ information-seeking habits, including their use of the library.

**We see a widening gap between the old business model under which many libraries are still operating, and the reality of how students are actually using them.**

## **Recommendation #2: Designing “mobile apps” to support new study practices**

In our post-interview discussions, many students discussed having used technology to create mobile app study tools. One respondent said she used her cell/smart phone to record herself reading lecture notes so she could listen to them again and again to better imprint them in her memory. Another student told us he photographed problem sets from a library reserve copy of a math textbook, which he could not afford to buy, so he could study while riding the bus to and from campus. Still another student used a Web site called *StudyBlue* to create flashcards she could review on her cell/smart phone.

These new study practices have a common thread—students study while they are on the go. In fact, they can study anywhere, eschewing heavy books in favor of portable devices that may be the size of a pack of playing cards and weigh even less.

In this recommendation we point to the entrepreneurial opportunities that may exist in developing customizable mobile apps for students and which would go far beyond generalized utility apps such as Wikipanion, CampusBooks, EverNote, and/or GoDocs.

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<sup>41</sup> Recent findings from the two-year Ethnographic Research in Illinois Academic Libraries (ERIAL) project with studies conducted on five Illinois campuses found students rarely asked for help from librarians, especially students who may have been in the greatest need of help. See *College Libraries and Student Culture: What We Now Know* (2011). Lynda M. Duke and Andrew D. Asher, editors at <http://www.erialproject.org/publications/ala-project/> (accessed August 30, 2011).

Instead, we see a need for easy-to-use customizable apps that allow students to build usable applications that meet their study needs for a given class.<sup>42</sup> Systems librarians, who understand how students find and use information, may be the best qualified to lead this charge and may benefit from working in collaboration with faculty, campus technologists, and/or commercial information publishers.

### **Recommendation #3: *Exploring the viability of social media one course at a time***

The findings from our latest study identify a widening gap between the potential of social media and its actual use in higher education. In our post-interview discussions with respondents, we found some students—the self-starters who had discovered the sweet spot of using social media sites for studying, learning, and excelling in their courses. While the visuals and the animation of a YouTube video kept students engaged with course material, it was the ability to stop, reflect, absorb, and ultimately, learn, that brought students back to using YouTube when studying difficult course material. Moreover, these self-starters also grasped, welcomed, and expected a diversity of dialogue and a democratization of knowledge from nodes everywhere in the world.

The main point? Some of today's students may understand what social media—beyond learning management systems like Blackboard and Moodle—can bring to new learning practices far more than their educators do. We recommend that instructors explore ways of incorporating social media into their coursework.

Frankly, students for whom digital communication is second nature will soon expect this. We also suggest that instructors conduct a thorough examination of the social media outlets that may be available to them for academic enhancement, including on-campus learning management systems or the social media frontier that students are discovering on their own. How could social media be used to reinforce and complement the key ideas from a course an instructor is teaching? How could a video from YouTube help learners comprehend the material beyond lectures and textbooks? Using social media for learning and studying will revolutionize the dissemination of information, ideas, and learning. In fact, judging from our findings, this revolution has already begun. It is imperative for professors to join it.

### **Recommendation #4: *Learning beyond self-styled techniques for managing IT devices***

In our study, most respondents took a "less is more" approach to selecting the IT devices they had in use and the applications they were running. Overall, we found most students using few devices, few applications, and/or few Web sites. Further, very few students said they had used library-based information resources in the previous hour, such as scholarly research databases, learning management systems, and/or exchanges with librarians. Our findings suggest that the students who were in the library during crunch time were using a strategy for managing technology that consciously pared down by the number of devices they were using and the applications and Web sites they were running.

Consistent with findings in our previous studies, students seem to develop these self-styled techniques for managing technology without formal instruction from faculty or librarians.<sup>43</sup> And, while it is less clear what impact students' self-styled techniques have on overall learning or on how their

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<sup>42</sup> For design guidelines for building usable apps for mobile devices, see M. Krueger (2011). Jakob Nielsen on Usability for Mobile Sites and Apps. *ClickZ*, from <http://www.clickz.com/clickz/column/2099266/jakob-nielsen-usability-mobile-sites-apps>. We also recommend Jakob Nielsen's Alertbox for reading more of the guidelines for designing "mobile apps" for cell/smart phones and iPads, given his company's usability testing of new products. See <http://www.useit.com/>, (both sources accessed September 1, 2011).

<sup>43</sup> See A. J. Head, and M. B. Eisenberg, (2010). "Truth be Told: How College Students Evaluate and Use Information in the Digital Age," pp. 35 – 37 from [http://projectinfolit.org/pdfs/PIL\\_Fall2010\\_Survey\\_FullReport1.pdf](http://projectinfolit.org/pdfs/PIL_Fall2010_Survey_FullReport1.pdf) (accessed August 9, 2011).

information-seeking strategies may develop in the long run, librarians and instructors from kindergarten through graduate school, must recognize that fundamental changes are taking place in their students’ information and technology environments as well as their work habits and approaches to studying and learning.

We believe students need formal help to cope with overload and wade through the glut of information available to filter out what is most credible and relevant. They also need help in managing and making the best use of their digital tools. For example, how does one take and manage notes in an electronic, online environment? How do learners of all ages manage their learning content if all readings are provided electronically, instructors post their lectures/PowerPoints on the Web, and online discussions are a central part of course learning and interaction?

We are not talking about simply learning how to use new tools and technologies. New tools and technologies will continue to emerge and evolve. We are talking about recognizing that there are entirely new ways of finding, using, processing, and communicating information.

We—faculty, librarians, and technologists—need to work with our students from grade school through college, to discover new and creative approaches and skills, and then ensure that our students learn and use these approaches and skills effectively and efficiently. While acknowledging our own biases, the findings from this study tell us that information literacy is the cornerstone of learning in the second decade of the 21<sup>st</sup> century.

**We believe students need formal help to cope with overload and wade through the glut of information available to filter out what is most credible and relevant.**

## Appendix A: Methods

The Project Information Literacy Research Team conducted 560 face-to-face interviews with full-time undergraduates on 10 US college campuses between April 7, 2011 and May 26, 2011.<sup>44</sup>

A highly structured interview format was employed. Trained PIL interviewers asked respondents a series of 17 scripted questions. Interviews took place in the campus library one to three weeks before the end of the spring term and before finals week began. The purpose of the interviews was to collect data about what IT devices and program and applications students were using and how they multitasked in the library during the final weeks of the term.

As part of our interview, we conducted an inventory of the computing devices, applications, and Web sites respondents had in use at the time of our interview. The inventory consisted of a count of IT devices students had turned on and "in use."

These devices included cell/smart phones, personally owned laptops, library desktop computers and laptops, netbook/mini computers, tablets (e.g., iPads), media/audio players (including iPods), mini tablets (e.g., iPod Touches), eBook readers (e.g., Kindles), and scientific calculators. We defined "in use" as being a state where a device, an application, or a Web site is "open" and "running" and ready to use (e.g., a cell phone on vibrate mode) and/or in active use.

### Purpose of Study

The purpose of the PIL technology study was to collect qualitative and inventory data about early adults' use of information technology devices, programs, and applications, as well as their multitasking behaviors during the final weeks of the term while in the library. Our preliminary research suggests that students build and create individualized information spaces in order to study, research, produce, play, communicate—and multitask.

The goals were twofold: (1) to learn how students manage and use IT devices, applications, and Web sites for supporting different kinds of activities during the final weeks of the term, and (2) to understand what devices and sources students select and use for creating information support systems while they were in the campus library.

We also explored deeper issues about how today's college students are using libraries, how and what kind of technology use occurs in libraries, and what the activities of research, studying, and learning are coming to be.

Overall, the ongoing goal at PIL is to release practical and applicable findings which inform an understanding of the student research process, especially what students experience when finding and using information for course-related research and in their everyday lives.

Ideally, we hope for direct value to numerous constituents in academic settings, including professors, librarians, and administrators. The findings and recommendations may inform practices for imparting

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<sup>44</sup> Members of the PIL Research Team included Elizabeth L. Black, Jordan Eschler, Susan Gilroy, Alison Head, Carolyn Salvi, Michele Van Hoeck, and Sarah Vital. Each researcher underwent training through the Collaborative Institutional Training Initiative, a subscription service providing research ethics education and training offered to all members of the research community. If a PIL researcher provided a reference or taught courses at a given campus as part of his or her full-time job, that researcher did not collect data from students at that "home campus."

information literacy skills, standards, and competencies to a growing population of students, who were "born digital."<sup>45</sup>

At the same time, we make no claims that data from this study and subsequent findings from our research are generalizable to larger populations, or beyond the sample in our study.

While fully acknowledging that further research is required to confirm any of PIL's findings, especially in terms of generalizing to the full college population, the data we have collected, and the data analysis applied and reported has shown consistent responses and fairly revealing patterns about the strategies for technology usage of the students we studied.

## Research Liaisons

PIL has over 100 institutions of higher learning in the US in our PIL Volunteer Sample.<sup>46</sup> We rely on this sample for specifying individual samples used in each of the studies in our ongoing research.

This study's sample was made up of public four-year institutions (40%), and to a slightly lesser degree private four-year institutions (30%) and community colleges (30%).

In order to facilitate our data collection, we enlisted the help of research liaisons working in each campus library. The liaisons had job titles ranging from library directors to information literacy specialists to reference librarians.

Liaisons were instrumental to our research efforts in three essential ways: (1) helping PIL obtain access to campus administrators for Internal Review Board (IRB) review and approval, (2) providing PIL with baseline information about the library setting before our visits, and (3) advising the PIL Team when to conduct interviews during the library's peak times of operation.

Appendix A, Figure 1 shows baseline information about each institution and campus library in the sample.

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<sup>45</sup> The phrase *born digital* used in this proposal is derived from the Berkman Center for Internet & Society at Harvard University and the "Youth and Media Project," and John Palfrey and Urs Gasser. According to the project's site, *born digital* describes "those who grow up immersed in digital technologies, for whom a life fully integrated with digital devices is the norm." Retrieved from <http://cyber.law.harvard.edu/research/youthandmedia/digitalnatives>. Born Digital is also the main title of Palfrey's and Gasser's book: *Born digital: Understanding the first generation of digital natives* (2008). Philadelphia: Basic Books, (accessed September 1, 2011).

<sup>46</sup> For a map of the complete PIL Volunteer Sample, see <http://tinyurl.com/3to4uvo>

**Appendix A, Figure 1: Institutions in the Spring Interview Sample**

	<b>PIL Research Liaison</b>	<b>Institution Type</b>	<b>Full-time Enrollment<sup>1</sup></b>	<b>Number of Library Floors Open to Students</b>	<b>Size of Collection (i.e47., volumes)</b>	<b>Computers for Public Use by Students</b>
California Maritime Academy (CSU System)	Michele Van Hoeck, Library	Four-Year Public	823	1	40,000	15
City College of San Francisco Rosenberg Library	Wendy Owens, Library	Community College	34,855	3	175,000	107
Columbus State Community College (Delaware Campus Branch Library)	Steve Mallett, Library	Community College	366 <sup>1</sup>	1	300	73
Northern Kentucky University Steely Library	Mary Chesnut, Library	Four-Year Public	13,179	4	317,436	168
Ohio State University (1) Science & Engineering Library  (2) Thompson Library	Elizabeth L. Black, Ohio State University Libraries	Four-Year Public	42,082	5  12	250,000  1.1 million	92  230
Saint Mary's College of California St. Albert Hall Library	Sarah Vital, Library	Four-Year Private	2,799	3	233,556	60
Santa Rosa Junior College Doyle Library	Nancy Persons, Library	Community College	33,000	3	129,838	336
Tufts University Tisch Library	Laura L. Walters, Library	Four-Year Private	5,164	4	927,000	62
University of Puget Sound Collins Memorial Library	Jane Carlin, Library	Four-Year Private	2,607	5	425,000	34
The University of Washington Odegaard Library	Jill McKinstry and Heather Gillman, Odegaard Library	Four-Year Public	29,574	4	145,000	491

## Human Subjects Review and Confidentiality

Prior to data collection, the PIL research protocol underwent Human Subjects Division Review and received approval at the University of Washington.<sup>47</sup> Further, the PIL research protocol underwent Human Subjects Division Review/Internal Review Board Review and approval on each campus where we interviewed students.

UW's Human Subjects' reviewers certified PIL's survey project as "exempt," due to the no-risk nature of the research methodologies we used to collect data and guarantee confidentiality.

Accordingly, all respondents in the sample received both a verbal and written consent, informing them of the voluntary nature of participation, an explanation of the purposes of the research and the expected duration of participation, a description of the procedures to be followed, and assurances of confidentiality of the data and anonymity of their identity, as well as contact information for the principal investigator.

All measures were used to protect any identifiable data (e.g., each participant was assigned a unique identification code; all responses and code keys were stored separately in locked files or on secured computers). No participants or individual institutions were identified in any reports of the research.

## Sample Plan and Interviewing Procedures

Prior to conducting the student interviews, each PIL interviewer reviewed and then pre-tested the script. Pre-tests were conducted with 17 full-time students enrolled at institutions in the study. Students interviewed at the pre-test stage were not included in the study's sample.

Interviewers also made recommendations for wording changes and the layout. Minor revisions were made to wording to improve the general clarity of the script. Further revisions were made to the layout and functionality of the data entry form we used for inputting data from the interviews. We utilized the University of Washington's (UW's) WebQ software and a secure file server for collecting and storing the research data on the UW campus.

Since each interview setting (i.e., the campus library) did not include a list of known members at any given time, we used a multistage cluster-sampling plan. Relying on baseline information from the study's research liaisons, we defined a set of sampling clusters for each library setting. The number of clusters was based on the number of places where students congregated in each library setting (i.e., reference, banks of computer workstations, study tables, study carrels, study rooms, and soft furniture, and library cafes).

Liaisons also provided us with an estimate of how many students could be found in each cluster during a peak time. This gave us a preliminary sampling plan for planning our visits. Once we were on site, we modified the counts per cluster, as needed.

Interviews were conducted at different times when each library was reportedly in high use (i.e., weekdays, especially Wednesdays and Thursdays, nights, and weekends).

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<sup>47</sup> The PIL Research Protocol for this study was approved by the University of Washington, Human Subjects Division and was granted a Certificate of Exemption (#40317) on February 28, 2011. The protocol title was "What Personalized Information Support Systems Do College Students Create in the Library?"

Each PIL research liaison also provided the figures used in the snapshots of a “peak hour” in their library (See Appendix A, Figure 2). These figures are an approximation of students on site in the library at a peak hour—moment in time—on a busy day during the term.

We recruited volunteers by approaching students in their workspaces, identifying ourselves as researchers for a national study based at The University of Washington, and asking if they had time to participate in a 5- to 20-minute interview.

When students had time and agreed to participate, we proceeded with the interview protocol. In cases where students expressed any concerns about participating, we quickly concluded our interaction with them and thanked them for their time. Appendix A, Figure 2 shows details of our data collection details.

### Appendix A, Figure 2: Data Collection Details

	Dates Interviews Conducted	Number of PIL interviewers	Snapshot of “Peak Hour” Estimate (i.e., number of students)	Sample (n of student interviews)	Percentage of Total Sample
California Maritime Academy (CSU System)	April 7, 14, 20, & 22	2	55	58	10%
City College of San Francisco Rosenberg Library	May 11 & 12	2	650	51	9%
Columbus State Community College (Delaware Campus)	May 16, 17, 19, 25, & 26	1	80	30	5%
Northern Kentucky University Steely Library	April 13 & 14	1	191	50	9%
Ohio State University (1) Science and Engineering Library  (2) Thompson Library	May 16, 17, 18, 19, 20, 23, 23, 25, & 26	1	471  745	50  50	18%
Saint Mary’s College of California St. Albert Hall Library	May 3 & May 4	2	300	53	10%
Santa Rosa Junior College Doyle Library	May 16, 17, & 18	2	450	65	12%
Tufts University Tisch Library	April 26, 27, 28 & 30	2	1403	50	9%
University of Puget Sound Collins Memorial Library	April 19, 29, & May 6	1	300	47	8%
The University of Washington Odegaard Library	May 15, 17, 18 & 22	1	841	56	10%

We interviewed participants on four topics: (1) activities they had been involved in while they were in the library within the previous hour; (2) the information technology devices they were using at the time of the interview and for what purpose; (3) what applications, Web sites, and print sources they were using at the time of the interview; and (4) their overall use of social media while involved in work on assignments.

Following the interview, each respondent was debriefed about the purpose of the study. If a respondent's interest was piqued, the interviewer engaged the respondent in an open-ended discussion. Nearly two-thirds of the sample agreed to these more in-depth exchanges.

Often these discussions covered students' use of Facebook and other social media for coursework, their methods for managing technology, and new types of learning practices they had come to use for course-related research.

Once the interview concluded, the researcher answered seven related questions, which did not require the respondent's input (i.e., the respondent's gender, campus location and type, and a tally of the number of IT devices being used). Overall, the interview protocol had 24 question items.

### **Student Sample**

Interviews were conducted with students at 10 different institutions and in 11 campus libraries during the last two to three weeks of the term before finals week began.<sup>48</sup> Appendix A, Figure 3 provides an overview of the demographic make-up of the sample.

According to our results, more respondents were sophomores (42%) than any other year in our study.<sup>49</sup> Over half of the sample (53%) was between 18 and 20 years old.

At the same time, more students in the sample were majoring in social sciences (22%) and the sciences (18%). Other respondents were in occupational training programs, including nursing (14%) or were studying architecture and engineering (11%), business administration (11%), arts and humanities (10%), or were fulfilling general education requirements (9%). A small number of respondents (6%) consisted of double majors.

The most frequently reported grade point average (GPA) was in the category of 3.4 to 3.7 (29%). As a point of reference, we calculated this GPA as between a B+ and an A-.<sup>50</sup>

We acknowledge the sample was limited in the number, nature, and range of participants. We recognize that voluntary participation always introduces a certain amount of inherent bias, as do "self report" data collection methods, such as some of the interview questions used in our research design.

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<sup>48</sup> At Ohio State University, student interviews were conducted at both Thompson Library (n=50) and the Science and Engineering Library (n=50), by PIL researcher, Elizabeth L. Black, an Assistant Professor and Systems Librarian for Ohio State University Libraries, who was on Faculty Special Assignment to work on the PIL study. As part of conducting the PIL interviews, Black collected additional data for her own research needs about OSU students' use of the campus's learning management software and its link to the related library page in a series of questions following the PIL interview.

<sup>49</sup> Students in the sample who were enrolled in community colleges were credit students. Since many credit community college students planned to transfer to four-year institutions, first year students were treated as "freshmen" and second-year students at community colleges were treated as "sophomores" during our coding and analysis.

<sup>50</sup> For purposes of our analysis, we employ University of Washington's scale for translating GPA to letter grades, courtesy of the Office of the Registrar, at [http://www.washington.edu/students/gencat/front/Grading\\_Sys.html](http://www.washington.edu/students/gencat/front/Grading_Sys.html), (accessed July 6, 2011).

**Appendix A, Figure 3: Description of Student Sample**

Demographics	Count	Frequency
<b>At a Glance:</b>		
Total students interviewed	560	100%
Total number of US campuses	10	100%
Total number of libraries	11	100%
<b>* Gender:</b>		
Female	294	53%
Male	266	48%
<b>Year:</b>		
Freshman	132	24%
Sophomore	237	42%
Junior	100	18%
Senior	91	16%
<b>Age Range:</b>		
18 to 20 years old	295	53%
21 to 22 years old	152	27%
23 to 25 years old	44	8%
26 to 30 years old	38	7%
Over 30 years old	31	5%
<b>* Area of Study:</b>		
Architecture and Engineering	61	11%
Arts and Humanities	57	10%
Business Administration	63	11%
General Education, inc. "undecided"	49	9%
Occupational training, inc. nursing	76	14%
Sciences	101	18%
Social Sciences	121	22%
Double Majors	32	6%
<b>Grade Point Average (GPA):</b>		
Below 1.7	1	---
1.7 to 2.0	4	1%
2.1 to 2.3	5	1%
2.4 to 2.6	38	7%
2.7 to 3.0	118	21%
3.1 to 3.3	120	21%
3.4 to 3.7	162	29%
Over 3.7	71	13%
Declined to state	18	3%
Does not remember	23	4%
<b>Type of Institution:</b>		
Private college or university (4-year)	150	27%
Public college of university (4-year)	263	47%
Community college (2-year)	147	26%

\* Percentages may not add to 100% due to rounding

## Methodological Issues

There are challenges associated with the use of interviews as a research technique.<sup>51</sup> One issue is the generalizability of the data collected from qualitative interviews.

When considering the limitation of the generalizability of interview data, we point to the main purpose of qualitative research: interviews are not necessarily used to produce generalizable findings about a sample but to deeply understand a specific situation as participants' behavior is recorded in a natural setting (i.e., media multitasking in a library during crunch time).

Therefore, we do not assume that our findings are representative of a larger population of students who may have been enrolled at the same campuses where we conducted interviews, or beyond. Our findings, however, reveal consistent patterns from respondents that do lend credibility to our findings about how a sample of students managed and used technology in campus libraries during the final weeks of the term.

Another frequent issue with interviews is reliability. To enhance the reliability of our interview technique, a large majority of the questions we asked were highly structured and had finite response categories that were presented to respondents.

Structured interviewing allows for greater standardization of responses. A pre-arranged list of categories allowed us to collect uniform data that was more easily quantified and compared with responses from other students in the sample. In addition, a structured interview creates more consistency when several interviewers are used in a variety of locations.

Of course, the cost of using highly structured interviews is a lack of flexibility for exploring different topics respondents may bring up. To counter this, we expanded our debriefing period to include a discussion of topics in greater depth. In many cases, but not all, this post-interview discussion allowed the researcher to collect anecdotes, quotes, and add to the richness of the data.

All in all, interview methodologies depend on respondents providing accurate and complete answers. Accordingly, the interviewer must endeavor to establish trust and rapport while keeping track of the responses. Bias on both sides of this kind of exchange is a formidable issue. Whether it is the way the interviewer asks a certain question, or a respondent interprets and then answers a question, bias can be readily introduced.

To this end, we used *methodological triangulation* as a feature of our study design. In addition to the structured interview, we collected data using direct observation. At one point in the interview, we observed how respondents using their primary devices. That is, we asked respondents to voluntarily share with us what programs and Web sites they had open and running on their primary devices at the time we were interviewing them.

Despite making every attempt to compensate for the limitations of our study methodologies, we fully acknowledge future research is required to confirm our findings, especially as it may apply to others in the college population. However, these findings should not be viewed as comprehensive, but as another part of our ongoing research.

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<sup>51</sup> We acknowledge the following paper for its review of the methodological issues with the interviewing technique: S. Sharma, (2010). Qualitative Methods in Statistics Education Research: Methodological Problems and Possible Solutions. *ICOTS8 Conference Paper*, International Association of Statistical Education (IASE), from [http://www.stat.auckland.ac.nz/~iase/publications/icots8/ICOTS8\\_8F3\\_SHARMA.pdf](http://www.stat.auckland.ac.nz/~iase/publications/icots8/ICOTS8_8F3_SHARMA.pdf), (accessed July 6, 2011).

## Research Questions of the Ongoing PIL Study

This latest PIL study about managing and prioritizing technology is as an integral part of answering PIL's overarching research question: In the digital age, how do early adults conceptualize and operationalize course-related research and research for solving information problems related to their daily lives?

The trajectory of our ongoing research has been to answer the following research questions:

1. How do early adults define and conceptualize the process of research (i.e., both course-related and "everyday" research)?
  - a. What does the activity of research mean to early adults (in their own words and from their own experiences)?
  - b. What barriers and obstacles keep early adults from taking the first steps in both course-related and everyday research?
2. What steps do early adults take to locate, evaluate, select, and use resources required for course-related and everyday research?
  - a. What processes do early adults employ and what "workarounds" have they developed for evaluating and selecting resources?
  - b. How do early adults engage in collaborative information problem solving about conducting course-related and everyday research?
  - c. How do early adults use peer-to-peer "socially constructed" digital resources (e.g., Wikipedia, course wikis, and/or blogs) when conducting course-related and everyday research?
  - d. How do early adults determine if peer-to-peer resources are credible and reliable sources of information for course-related research assignments and/or for everyday research, if at all?
  - e. How do early adults' strategies for conducting course-related research vary from the search for information about everyday problems?
  - f. How do early adults' strategies systematically vary within the population of institutional settings (i.e., community colleges vs. state colleges and universities and private colleges and universities)?

Ultimately, findings from PIL will have considerable impact on the understanding of information literacy in five major areas:

1. How information literacy education and coaching are provided to early adults by professors and librarians for conducting course-related and everyday research.
2. How a college curriculum that requires course-related and everyday research is developed and communicated to early adults.
3. How the design of online resources used by campus libraries and produced by database vendors, enhance or detract from early adults' research experiences.

4. How (and to what extent) different types of institutions affect the information-seeking strategies of their early adults.
5. How to improve the understanding of the problem-solving potential of current US college students who are an important subset of the "adult" cohort, given their unprecedented enrollment in institutions of higher education, their professional destinies, and their likelihood to have "grown up digitally."

## Appendix B: Interview Script

### *Interview Protocol and Data Input Form*

#### *Project Information Literacy | Personalized Information Spaces Study*

*University of Washington Human Subjects Approval: Certificate of Exemption (#40317 on February 28, 2011)*

#### Question 1.

Introductory comments to participant:

We find there are many reasons student might be using the library on any given day. They may be looking for materials, using the computers to check messages, studying, or they may be relaxing and visiting with friends in between classes.

\*\* IMPT. QUOTE AREA: Researcher: If the student says a memorable quote, or has a short anecdote, about how and why he or she uses the library—the real purpose(s) for coming to the library—jot it down so it can be input into open-ended Question #24 about notes from the field.

I'm going to read you some categories. Can you tell me what have been up to in the last hour? (i.e., check ALL that apply)

- Finding materials; carrying out library research
- Preparing an assignment(s) for submission (e.g., writing a paper, problem sets)
- Studying/reading (e.g., reviewing, reading for courses)
- Checking for new messages/posts (e.g., email, IM, Facebook)
- Using a computer to satisfy a personal curiosity (e.g., sports score, news, gossip)
- Meeting with friends/other students
- "Killing time" between classes, relaxing, hanging out
- Other:

Question 2 and 3 (combined for easier administration in the field during the interview)

Q2. What information technology devices are you using right now? (check all that apply)

Researcher: If a student is using more than one of the same kind of device, e.g., two laptops), make a note in the other category below.

Q3. What is the main type of activity you are doing with each device right now?

Researcher tip: Please initial the ONE kind of activity for each device, only one per device: CW for coursework, CO for communication, EN for entertainment, PR for personal research, S for scheduling, NBU for not being used. For example: LaptopCW

Cell phone, includes smart phone  
 eBook Reader (e.g., Kindle, Nook)  
 Library desktop computer  
 Laptop  
 Library-owned laptop  
 Netbook/Mini computer  
 Tablets, e.g., iPad  
 MP3 players, e.g., iPod  
 Mini tablets e.g., iPod Touch  
 Scientific calculator  
 Other:

Matrix Question Responses for Q3 on the WebQ form will look like this:

Coursework (CW)  
 Communication (CO)  
 Entertainment (e.g., gaming, videos) (EN)  
 Personal research (e.g. checking a sports score) (PR)  
 Scheduling (e.g., keeping track of time, calendar dates) (S)  
 Not being used at all (NBU)

Question 4.

Which one of these devices is the essential, primary device for what you are doing right now?

Cell phone, includes smart phone  
 eBook Reader (e.g., Kindle, Nook)  
 Library desktop computer  
 Laptop  
 Library-owned laptop  
 Netbook/Mini computer  
 Tablets, e.g., iPad  
 MP3 players, e.g., iPod  
 Mini tablets, e.g., iPod Touch  
 Scientific calculator  
 Other:

Question 5.

Is the essential device owned by student or shared (campus workstation)?

Owned by student  
 Shared (campus workstation/laptop owned by the library)  
 Other:

Question 6 and 7 (combined for easier administration in the field during the interview)

Q6. What applications do you have open on your primary device right now (includes tabs)?

Q7. What is the main kind of activity you are doing with each of these programs or applications?

Researcher: These are applications that may or may not be downloadable from the Web (e.g., Gmail yet also MS Outlook would both qualify—but a Web site does not, that's the next question #8).

\*\* IMPT. QUOTE AREA: Researcher: If the student says a memorable quote, or has a short anecdote, about his or her person and school-related email use, jot it down so it can be input into open-ended Question #24 about notes from the field.

Researcher tip: Please initial the ONE kind of activity for each device, only one per device: CW for coursework, CO for communication, EN for entertainment, PR for personal research, S for scheduling, NBU for not being used. For example: GamingEN

- Email (i.e., Gmail, MS Outlook)
- Gaming application (e.g., World of Warcraft)
- Media/audio playing applications (e.g., iTunes, Real Player)
- Multimedia production application (e.g., iMovie)
- PDF readers (e.g., Acrobat)
- Presentation software (PowerPoint)
- Spreadsheet (e.g., Excel)
- VOIP (e.g., Skype)
- Web browser (i.e., Internet Explorer, Chrome, Firefox)
- Word processing (e.g., MS Word)
- Other:

Matrix Question Responses on the WebQ form will look like this:

- Coursework (CW)
- Communication (CO)
- Entertainment (e.g., gaming, videos) (EN)
- Personal research (e.g. checking a sports score) (PR)
- Scheduling (e.g., keeping track of time, calendar dates) (S)
- Not being used at all (NBU)

Question 8.

What Web sites, by name, do you have open now on your primary device and what kind of activity are you doing with the site?

Researcher tip: Write in the name of the site followed by an initial for the kind of activity being done: CW for coursework, CO for communication, EN for entertainment (includes gaming), PR for personal research (e.g., checking a sports score), and S for scheduling. For example: WikipediaCW  
 If no sites are being used write in NBU (none being used)

Site by name (e.g., Wikipedia)	Type of activity (e.g., CW)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Question 9.

Specifically, what online library databases are you using right now, if any?

- ABI Inform (ProQuest)
- Academic OneFile (Gale/Cengage InfoTrac)
- Academic Search Complete (EBSCO)
- Academic Search Premier (EBSCO)
- Academic Universe (Lexis Nexis)
- EI Compendex (Elsevier)
- ERIC
- Factiva (Dow Jones)
- GreenFile (EBSCO)
- JSTOR
- MLA
- Newsstand (ProQuest)
- PsycInfo (CSA/ProQuest)
- Science Direct (Elsevier)
- World Cat (OCLC)
- None; using no library databases
- Other(s):

## Question 10.

Are any print materials being used right now?

Notebook (e.g., binder, pad of paper, drafts of papers)  
 Course syllabus/assignment sheet  
 Library books for coursework  
 Reserve readings  
 Library journals  
 Personally owned books, includes textbooks  
 Charts/maps  
 Photos  
 Magazines/newspapers for coursework  
 Magazines/newspaper for pleasure/everyday life research  
 Books for pleasure/everyday life research  
 None, using no print sources  
 Other:

## Question 11.

What is your age?

18-20 years old  
 21-22 years old  
 23-25 years old  
 26-30 years old  
 Over 30 years old

## Question 12. (For use at community colleges)

What is your course level/year in college (i.e., specifically, how many years you have been on campus, not counting APA credits from high school)

Overall, I have taken FEWER than 12 units during the time I have attended this school  
 Overall, I have taken MORE than 12 units during the time I have attended this school  
 Does not apply to me

(For use at four-year institutions)

Freshman  
 Sophomore  
 Junior  
 Senior

## Question 13.

What is your major area of study?

(Researcher: Please put individual majors into one of these categories)

>>> \_\_\_\_\_ (Write in major during the interview)

Architecture and Engineering  
 Arts and Humanities  
 Business Administration  
 Double Majors (e.g., Arts and Humanities + Social Sciences)  
 General Education (includes AA, breadth requirements, undeclared majors)  
 Occupational Training (includes Nursing, 2 yr. and/or 4 yr. programs)  
 Social Sciences  
 Sciences (includes computer and physical sciences)

Question 14.

What is your GPA?

- Below 1.7
- 1.7-2.0
- 2.1-2.3
- 2.4-2.6
- 2.7-3.0
- 3.1-3.3
- 3.4-3.7
- 3.8-4.0+
- Declined to state

Question 15.

In the last hour, any of these library services or resources used?

- Library book(s)
- Library catalog (i.e., OPAC)
- Library databases
- Library equipment (e.g., computers, printers)
- Library journals/magazines (on-site print copies)
- Library portal/Web pages
- Librarian (i.e., face-to-face exchange)
- Online reference ("Ask a Librarian" chat/email/IM)
- Snack area/cafe
- None
- Other:

Question 16.

How often do you use social media (i.e., Facebook, Twitter, texting) when working on assignments?

\*\* IMPT Quote Area—Researcher: If the student says a memorable quote, or has a short anecdote, about their Facebook use, in general, for personal use and for school use, jot it down so it can be input into open-ended Question #24 about notes from the field. We will use the quote in the final report, if it fits—we need this data, too.

- Almost always
- Often
- Sometimes
- Rarely
- Never

Question 17.

Interested in voluntary, follow-up interview?

First name (only): \_\_\_\_\_

Cell phone number: \_\_\_\_\_

>> END OF INTERVIEW

Thank the participant for his or her time and debrief, probing for Q24 approaches, experiences, and direct quotes.

DATA INPUT BY RESEARCHER AFTER THE INTERVIEW CONCLUDES

Question 18. \*\* Researcher ONLY: not asked of participant during the interview \*\*

When inputting the data into WebQ enter the participant code:

(Institution initials + participant # + researcher initials + date, e.g., UW40AH4.7)

Question 19. \*\* Researcher ONLY: not asked of participant during the interview \*\*

When inputting the data into WebQ enter the name of the institution where the data was collected (note all researcher only responses are flush right).

Cal State Maritime  
Columbus State Community College  
Northern Kentucky University  
Ohio State University  
    > Engineering & Science Library  
    > Thompson Library  
Saint Mary's College of California  
San Francisco City College  
Santa Rosa Junior College  
Tufts University  
University of Puget Sound  
University of Washington

Question 20. \*\* Researcher ONLY: not asked of participant during the interview \*\*

Note the type of institution

Community college (i.e., two-year institution)  
Four-year public college or university  
Four-year private college or university

Question 21. \*\* Researcher ONLY: not asked of participant during the interview \*\*

Gender of participant

Female  
Male

Question 22. \*\* Researcher ONLY: not asked of participant during the interview \*\*

When inputting the data into WebQ provide the total number of DEVICES reported doing in Question #2. If a student happened to be using two of the same devices (e.g., two laptops), count each laptop so the sum is "two" when figuring out the total number of devices used.

1 device  
2 devices  
3 devices  
4 devices  
5 devices  
6 devices  
7 devices  
8 devices  
9 or more devices

Question 23. \*\* Researcher ONLY; not asked of participant during the interview \*\*

When inputting the data into WebQ provide the TOTAL number of different kinds of activities the participant reported doing in both #7 and 8 \*\*

(i.e., total number of different kinds of activities, coursework (CW) , communication (CO), entertainment (EN) , personal research (PR), and scheduling (S))

1 kind of activity (e.g., CW)

2 different kinds of activities (e.g., CW + CO)

3 different kinds of activities (e.g., CW + CO + EN)

4 different kinds of activities (e.g., CW + CO + EN + PR)

5 different kinds of activities (e.g., CW + CO + EN + PR + S)

\*\* Question 24: Researcher notes taken in the field

Additional notes from Researcher, quotes for telling the students' stories from the field:

1. Quotes/anecdotes from Question #1 about library use and the reason(s) for using the campus library.

2. Quotes/anecdotes from Question #6 about email usage for personal use and/or for coursework.

3. Quotes/anecdotes from Question #16 about Facebook usage for personal use and/or coursework.

4. Any new types of research behaviors be used (e.g., using an iPhone to take a snapshot of pages, instead of using a photocopier)?

- END OF SCRIPT -

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