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Science and Technology Undergraduate Students' Use of the Internet, Cell Phones and Social Networking Sites to Access Library Information

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Abstract

Many academic libraries and publishers have developed mobile-optimized versions of their web sites and catalogs. Almost all database vendors and major journal publishers have provided a way to connect to their resources via the Internet and the mobile web. In light of this pervasive use of the Internet, mobile devices and social networking, this study examines the habits of 290 science and technology students (with majors in biology (51%), chemical engineering (15%), biological engineering (9%), kinesiology (5%), and animal science (4%)), to identify whether they use this technology for library-related activities.

The primary objective of this study was to identify whether the students use the Internet, their cell phones, and/or social networking sites to access scholarly information available through the library. Specifically, we were interested in finding

out: (1) how often students use the Internet and for what purposes; (2) what devices they use to access library information remotely; (3) for what purposes student use their cell-phones and whether they use them to access library resources, including our social networking sites; and (4) which social networking sites students use and for what purposes.

Even though there are widespread uses of the Internet, cell phones, and social networking, this study found that the majority of the students surveyed do not readily identify them as a means to access library-provided databases, the library catalog or to retrieve full-text journal articles on demand or on the go.

Background

"The millenials" typically people who were born in the eighties and nineties, as defined by the Oxford English Dictionary (2011), have grown up in the world of video games, computers, the web, instant messaging, and cellular phones (Maughan 2006). The latest information and communications technologies have always been part of their lives. They are format agnostic, nomadic, multitasking, experiential, collaborative, integrated, principled, adaptive, and direct (Abram and Luther 2004). In his focus group, Sweeney (2005) found that the millennials are gamers, enjoy gaming and media, expect nomadic, anytime- anywhere communications, are collaborative, multitask, learn experientially and continuously, and read less than other generations. He pointed out that "millennials think very differently, not only about technology but also about how services should be delivered digitally." He noted that they expect the flexibility, geographic independence, speed of response, time shifting, interactivity, multitasking, and time savings that digital networked services provide. He suggested that "millennial expectations, driven by favorable experiences with information technologies, will ultimately determine what, if any, library services they want or expect."

The mobile audience media company JiWire (2011) surveyed over 2,500 millennials regarding their use of mobile devices and found that the average millennial owned 2.4 connected devices. Among those who connected to the company's Wi-Fi networks, 62% used smartphones, 30 % used tablets, 71% used laptops and 38% used Wi-Fi music players to connect on-the-go. Because of millennials' pervasive use of the Internet and social networking sites, and the increasing ownership of mobile devices coupled with high speed wireless networks, librarians and other information workers hope to use these devices as a way to reach out to their patrons and help them to use mobile technology as an easy way to access library resources. They hope that these endeavors will help attract many users to their resources.

Many libraries and publishers have developed mobile web versions of their web sites and catalogs. Almost all database vendors and major journal publishers provide a way to connect to their resources via the mobile web. "Browsers are now appearing on mobile devices. Gearing resources to mobile web browsers and developing mobile webpages as opposed to mobile applications widens the potential audiences to all mobile searchers" (Murphy 2010).

In light of this pervasive use of the Internet, mobile devices, and social networking, this study examines the habits of undergraduate students to identify whether they use this technology for activities related to library research. The surveyed students were in an organic chemistry class for non-majors during the summer and fall semesters of 2011 when they completed the survey. These students were identified to be surveyed because they represent a broad spectrum of students with majors in science, agriculture and engineering disciplines.

The primary objective of this study was to identify whether the students use the Internet, their cell phones, and/or social networking sites to access scholarly information available through the library. Specifically, we were interested in finding out: (1) how often students use the Internet and for what purposes; (2) what devices they use to access library related resources remotely; (3) for what purposes student use their cell-phones and whether they use them to access library resources, including our social networking sites; and (4) which social networking sites students use and for what purposes.

We anticipated that this information would help us determine whether it is appropriate to target specific mobile applications for information retrieval and to introduce our users to our libraries' social networking sites. Since it appears that students are technology oriented, this information may encourage them to access scholarly information and seek assistance in ways they prefer.

At the University of Arkansas Libraries in Fayetteville, (University of Arkansas Libraries 2012), we have profile pages on Facebook, Twitter, and Foursquare. We also have several opportunities for our users to use their mobile devices in their information seeking experience. For instance, the library has a LibGuide listing the mobile-optimized applications available from vendors to access their information resources. The mobile-optimized library catalog serves as another gateway to access and search library resources on the go. Our users can also send a text-message or chat 24/7 with a librarian if assistance is needed, and we have enabled text-message capability in our online catalog where users are able to send the title and location of an item to their mobile phones.

Literature Review

The Internet, social networking sites, and mobile devices offer librarians and other client-oriented organizations endless possibilities for reaching out to their users. One librarian at Pennsylvania State University, (Mack et. al. 2007), conducted 47 instruction sessions in which he explicitly informed students that he often provided reference assistance via Facebook. In the following months he found that 29% of the questions he received came from Facebook, 28% via e-mail and 25% in person.

In their survey of librarians, Graham et al. (2009) found the most common uses of Facebook by libraries were to promote or advertise events within the library (62.7%); as a vehicle for entertainment purposes not related to work (56.9%); as well as making general announcements (52.9%). They found no libraries that were using Facebook to create cohorts for library instruction, and only 9.8% used Facebook in creating discussion threads. A significant number (27.5%) of respondents also reported feeling ambiguous about whether having a profile on Facebook actually accomplished anything for their libraries.

Bruce Jensen (2010, p6) pointed out that the commercial world is outpacing libraries in both awareness and adoption of mobile technology. He mentioned that while the magnetic appeal of networked mobile gadgets for entertainment and gaming is clear to most observers, "their equally attractive usefulness in the realms of instruction and information delivery, remains nearly untouched by most libraries".

Canuel and Chrichton (2010) found only 14% of the member libraries of the Association of Universities and Colleges of Canada advertised some type of mobile web presence, but it seems likely that every library will have such a mobile web presence or application in the future.

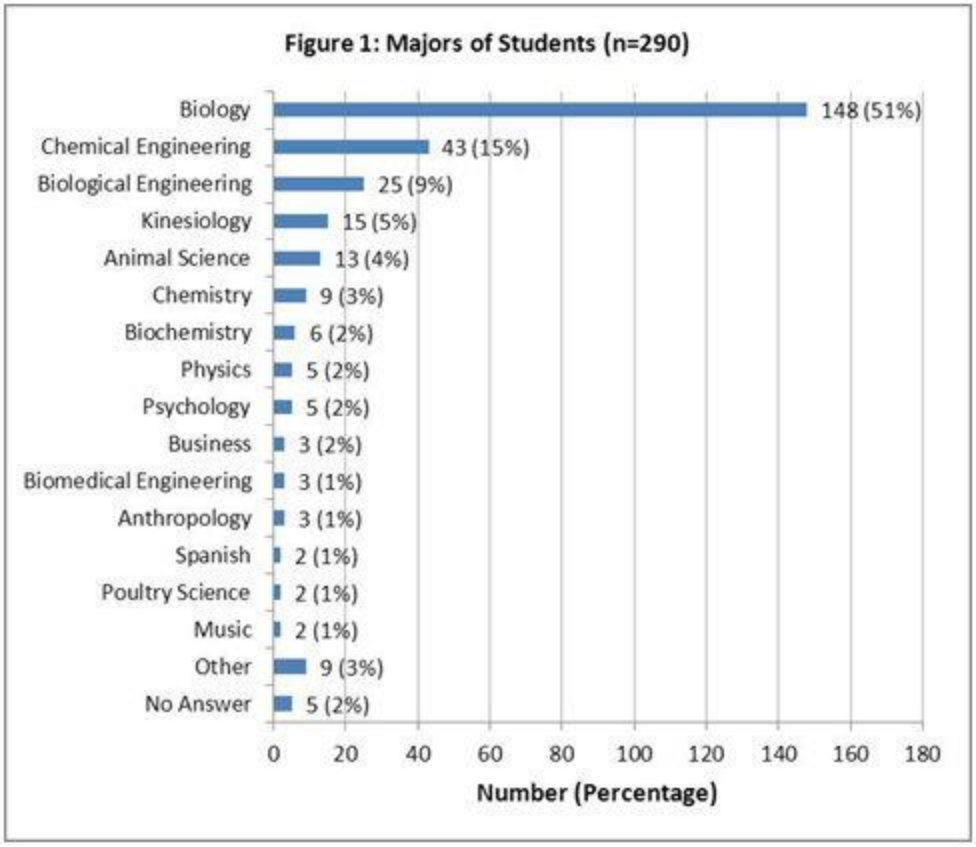
Purcell, Rainie, Rosenstiel and Mitchell (2011) from the Pew Internet and American Life Project found that 47% of American adults use their cell phones and tablet computers to get local news and information. Among the millennial generation, 94% are Internet users, 74% have broadband at home, 94% have cell phones, 55% have desktop computers, 70% have laptop computers, 69% have an iPod or MP3 player, and 12% have a tablet, such as an iPad. They also found that 51% of the millennials own a smartphone that they use for texting, taking pictures, going online, e-mailing, recording video, playing music and playing games. Likewise, Rainie (2011) found that millennials are increasingly connecting to the Internet wirelessly (81%) compared with 74% of Generation X (ages between 35-46 years) and 54% of younger boomers (ages between 47-56 years), and 83% of millennial who are Internet users use social networking sites as compared to 69% of Generation X and 57% of younger boomers.

In analyzing an organic chemistry laboratory class of student's communication preferences for scheduling an appointment, Tomaszewski (2011) found that 40% prefer walk-in, 23% SMS, 22% e-mail, 14% mail and 1% office hours. He concluded that as SMS technology becomes more convenient, unobtrusive, and inexpensive, students are more likely to use this technology for asking questions or scheduling appointments.

Methods and Demographics of the Study

This study collected data using a web-based in-class survey administered to several sections of organic chemistry for non-majors in the summer and fall 2011 semesters. The questionnaire was administered at the beginning of the class before the students had the benefit of the instruction. Forty five percent of students completing the survey had attended a library instruction session previously. Not all students answered all of the questions; the percentages in the tables and figures are calculated based on the total number of students who responded to the survey unless otherwise noted. Where relevant, the number of students who did not respond to a specific question is identified.

The 290 undergraduate students in these sections represent 27 different majors from science, agriculture, and engineering (most commonly from biology (51%), chemical engineering (15%), biological engineering (9%), kinesiology (5%), and animal science (4%) (See Figure 1 for a complete listing of majors)). Some students reported double majors, both of which were counted.



Males accounted for 53% of the respondents, while females accounted for 46%. Forty percent of the students were sophomores, 40% were juniors, 17% were seniors and 3% identified themselves in the "other" category. The majority (60%) of the students were in the 18-20 age range, 31% in the 21-23 age range, 3% in the 24-26 age range and 6% over 26 years old (See Table 1).

Table 1: Characteristics of Respondents, (n=290)

Age	Sophomore	Junior	Senior	Other	No Answer	Total (%)
18-20	110 (38%)	60 (21%)	4 (1%)	0 (0%)	0 (0%)	174 (60%)
21-23	3 (1%)	44 (15%)	39 (13%)	4 (1%)	0 (0%)	90 (31%)
24-26	2 (1%)	2 (1%)	3 (1%)	2 (1%)	0 (0%)	9 (3%)
Over 26	0 (0%)	10 (3%)	4 (1%)	2 (1%)	0 (0%)	16 (6%)
No Answer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	1 (0%)
Total	115 (40%)	116 (40%)	50 (17%)	8 (3%)	1 (0%)	
Gender						
Female	55 (19%)	52 (18%)	22 (8%)	4 (1%)	0 (0%)	133 (46%)

Male	60 (21%)	63 (22%)	28 (10%)	4 (1%)	0 (0%)	155 (53%)
No Answer	0 (0%)	1 (0%)	0 (0%)	0 (0%)	1 (0%)	2 (1%)
Total	115 (40%)	116 (40%)	50 (17%)	8 (3%)	1 (0%)	

Results and Discussions

Internet Access and Use

In answer to the question relating to the frequency of use of the Internet (Table 2), 35% of the respondents reported that they use the Internet hourly and 62% reported that they use the Internet daily. Only 1% reported that they use the Internet on a weekly basis. Internet usage is similar between genders, except for hourly usage, where more of the male respondents reported use.

The fact that 62% of the respondents use the Internet on a daily basis was surprising, since it is widely believed that the current students, who are mostly from the millennial generation, are almost continuously connected to social networking sites via the Internet. If we put this figure into context, most of these students are taking organic chemistry as non-majors and tend be pre-med, pre-vet, or pre-dental students. So they are self-motivated, and are intent on getting good grades in order to be accepted into medical, pharmacy, or veterinary schools. They are also taking science courses, which may require them to spend their time studying, working in laboratories, and using text books to study rather than to do active research on a regular basis. As expected, 99% of the students access the Internet hourly, daily, or weekly. This is consistent with the findings of Purcell, et al. (2011) that 94% of the millennial generation are Internet users.

Table 2: Frequency of the Use of the Internet, (n=290)

Level	Hourly	Daily	Weekly	Other	No Answer	Total
Sophomore	45 (16%)	70 (24%)	0 (0%)	0 (0%)	0 (0%)	115 (40%)
Junior	35 (12%)	77 (27%)	2 (1%)	2 (1%)	0 (0%)	116 (40%)
Senior	19 (7%)	27 (9%)	2 (1%)	2 (1%)	0 (0%)	50 (17%)
Other	3 (1%)	5 (2%)	0 (0%)	0 (0%)	0 (0%)	8 (3%)
No Answer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	1 (0%)
Total	102 (35%)	179 (62%)	4 (1%)	4 (1%)	1 (0%)	
Gender						

Female	41 (14%)	90 (31%)	1 (0%)	1 (0%)	0 (0%)	133 (46%)
Male	60 (21%)	89 (31%)	3 (1%)	3 (1%)	0 (0%)	155 (53%)
No Answer	1 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	2 (1%)
Total	102 (35%)	179 (62%)	4 (1%)	4 (1%)	1 (0%)	

Students were asked to identify three main reasons why they use the Internet. The responses are reported in Table 3. Seventy four percent of the respondents reported using the Internet in relation to their homework or classwork, to access Blackboard, or to find research articles and papers, but none of the respondents explicitly identified using the Internet to access library-related resources. Perhaps, it would be helpful to remind students in library instruction sessions that most of the articles they retrieve via Google, Google Scholar, and other Internet search engines are provided by the library, even though it may not be obvious to them when accessing these from on campus. Our library makes an effort to brand our resources and to inform patrons that they are accessing library resources that are not necessarily free.

Fifty one percent of the respondents reported using the Internet for e-mail, while 66% use the Internet for communication via social networking sites.

Thirty eight percent of the students use the Internet for leisure (entertainment, hobbies, play games, listen to music, watch videos, follow sports, and watch television). Thirty one percent use the Internet to access general information (news, general knowledge, and weather information). Eight percent identify banking, doing business, and shopping as one of the reasons they use the Internet.

Table 3: Reasons for Using the Internet

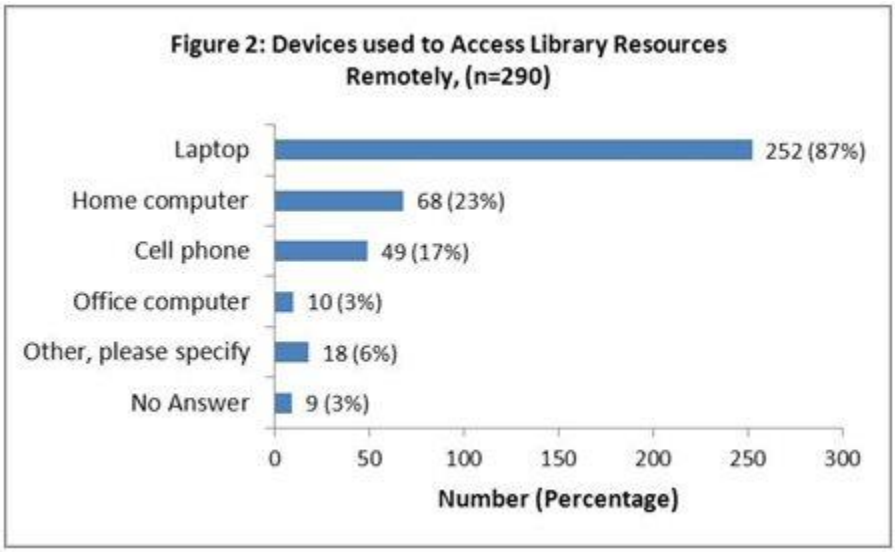
Concept	Concept Terms	Students (n=290)
Academic work	Homework, classwork, Blackboard, research	214 (74%)
Communication	Social networking, Facebook, Twitter, Tumblr	192 (66%)
E-Mail	E-mail	149 (51%)
Leisure	Entertainment, relaxation, hobbies, games, music, watch videos, YouTube, sports, TV	111 (38%)
General Information	News, general knowledge, weather, Wikipedia	91 (31%)

Business	Banking, business, shopping	23 (8%)

Devices Used to Access Library Resources Remotely

An overwhelming number (87%) of the students use their laptops to access library resources remotely (Figure 2). Students also reported using their home computers (23%), their cell phones (17%) and their office computers (3%). A few students reported using the university/library computers. Some students reported using more than one type of device to access the library's resources.

Even though 97% of the respondents access library resources remotely using one or more devices, they did not explicitly identify this activity as one of their top three choices for using the Internet (Table 3). This response was obtained from the direct question, "I access library resources remotely using my: laptop, home computer, office computer, cell phone or other, (please specify)", where they could have chosen one or more.



Cell Phone Use by Students

The majority of students (62%) reported using their cell phones for text-messaging every hour, while 32% used them on a daily basis (Table 4). Twenty-five percent used their cell phones for making calls every hour, while 64% used them on a daily basis. They also use their cell phones for e-mailing on a regular basis (26% every hour and 44% daily). Seventy-nine percent reported that they used their cell phones to browse the Internet (17% hourly, 49% daily, 10% weekly, 1% bi-weekly, and 2% monthly). Only 20% of them responded that they have never used their cell phones for this purpose.

Fifteen percent of the students reported using their cell phones either every hour or daily for instant messaging. Only 2% of the respondents reported using their cell phones to either access library databases or to search the library's catalog either every hour or daily. These findings reflect what Sweeney (2005) in his focus groups found, that "millennials own and frequently carry cell phones, laptops, and iPods, and they are much more frequent users of text messaging and instant messaging than older generations." Smith (2011) found 83% of adults own cell phones and three-quarters of them send and receive text messages, but the cell phone owners between ages of 18 and 24 are the most avid texters by a wide margin, and Tomaszewski (2011) found that 23% of the organic chemistry students prefer SMS technology as the preferred method for scheduling an appointment.

Based on these findings, it seems that if we are to reach out to students, text messages and e-mails may be the most appropriate ways to do so. In fact, our university already uses these methods of communication for inclement weather and other emergency notifications. Library patrons can also send a text-message or chat 24/7 with a librarian if assistance is needed. Since 66% of students browse the Internet using their cell phones hourly or daily but only a few use them to access library resources, it may be appropriate to begin informing them about our mobile applications through library instruction sessions and other outreach methods. Our library maintains a LibGuide that lists the mobile-optimized databases and resources that they can use, but it seems that students are not aware of them. Once informed, students may be more inclined to use these methods of accessing library resources remotely via their cell phones and other mobile devices. We believe that the use of mobile devices to access library resources will rise as users become aware of the mobile-optimized resources and as more users acquire data packages on their phones, but users will need to be informed about the existence of the mobile-optimized resources.

Table 4: Students' Use of Cell Phones, (n=290)

Cell-Phone Use	Every hour	Daily	Weekly	Every 2 weeks	Monthly	Never	No Answer
Text Messaging	180 (62%)	94 (32%)	8 (3%)	0 (0%)	1 (0%)	6 (2%)	1 (0%)
Calling	73 (25%)	185 (64%)	24 (8%)	1 (0%)	2 (1%)	4 (1%)	1 (0%)
E-mailing	76 (26%)	127 (44%)	15 (5%)	3 (1%)	3 (1%)	61 (21%)	5 (2%)
Browsing the Internet	49 (17%)	142 (49%)	29 (10%)	4 (1%)	5 (2%)	57 (20%)	4 (1%)

Instant Messaging (AIM, Yahoo, etc.)	12 (4%)	31 (11%)	17 (6%)	6 (2%)	16 (6%)	206 (71%)	2 (1%)
Accessing Library Databases	3 (1%)	3 (1%)	9 (3%)	8 (3%)	34 (12%)	232 (80%)	1 (0%)
Searching the Library's Catalog	1 (0%)	1 (0%)	4 (1%)	9 (3%)	33 (11%)	239 (82%)	3 (1%)

Students' Use of Social Networking Sites

As expected, 91% of the students (See Tables 5) use social networking sites. Eight percent do not use social networking sites, also with a higher percentage of male students. The majority of the students use Facebook and Twitter as their networking sites (See Figure 3).

The library already has Facebook and Twitter profiles links on its home page. On our Facebook page, there are links to find books, articles, course reserve, library hours, guides and tutorials, LibGuides, research help, etc. Our Twitter page is used primarily as an outreach and information source, regarding new databases, resources, what's happening in the library, events happening on campus, reporting on current events, etc. for our patrons. There may be a need for an advertising campaign to get more students and faculty to follow the library on Facebook and Twitter. As Mack et al (2007) have shown, when he reminded students during instruction sessions that he provided reference and research assistance via Facebook accounts, 29% of his questions subsequently came via this source.

Students use the social networking sites (See Table 6) primarily for staying in touch with friends and family, while a smaller percentage use it for communicating (talk or chat), for fun and entertainment, to view pictures and for news. No one mentioned using their social networking sites to follow their professors, libraries, schools, etc. It is obvious from these responses that students at present are not interested in, are not aware of, or are apathetic to the more formal uses that libraries and academic institutions have been increasingly adopting.

Table 5: Characteristics of Students Who Use Social Networking Sites, (n=290)

Level	Yes	No	No Answer	Total
Sophomore	108 (37%)	7 (2%)	0 (0%)	115 (40%)
Junior	104 (36%)	11 (4%)	1 (0%)	116 (40%)
Senior	46 (16%)	4 (1%)	0 (0%)	50 (17%)

Other	6 (2%)	2 (1%)	0 (0%)	8 (3%)
No Answer	0 (0%)	0 (0%)	1 (0%)	1 (0%)
Total	264 (91%)	24 (8%)	2 (1%)	

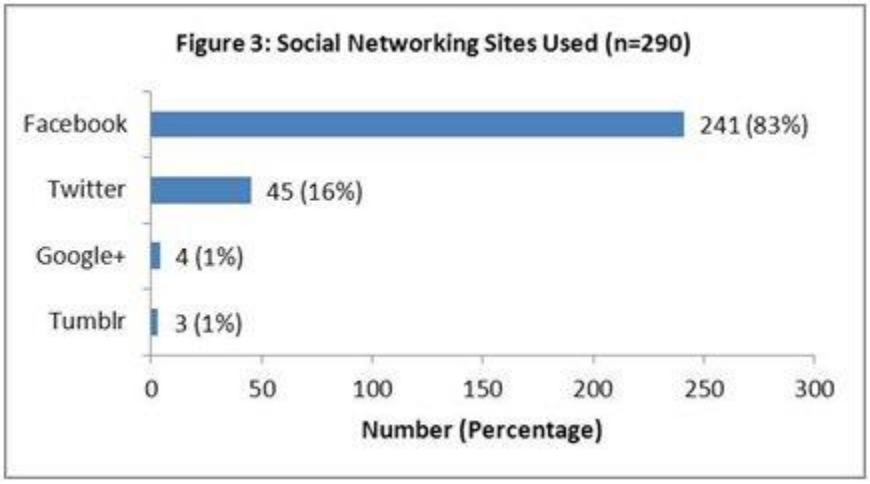


Table 6: Most Common Uses of Social Networking Sites, Based on Keywords Appearing in the Responses

Concept terms	Students (n=290)
Friends, family, people	142 (49%)
Staying/keeping in touch, in contact, connecting	118 (41%)
Social networking, interaction, socializing	30 (10%)
Chat, communication, talk	25 (9%)
Fun, entertainment, enjoyment	13 (4%)
Pictures, photos, videos	11 (4%)
News, information	11 (4%)

Conclusion

Even though there is a pervasive use of the Internet, cell phones and social networking, the majority of students surveyed do not readily identify them as a means to access databases, the library catalog, or to retrieve full-text articles on demand or on the go.

The results of this study provide ample evidence that many of our students are accessing the Internet using various devices. Ninety-seven percent of them access library resources remotely, mostly using their laptops and other computers. Only 17 percent of them use their cell phones to access library catalog and subscription databases resources remotely. Many of them have cell phones and other mobile devices that they could use to access library resources in their own way and in comfort. So it seems opportune to start the conversation in our information literacy sessions and demonstrate how these can be used to their advantage. We believe that as we inform students of the existence of our social networking sites, and the use of mobile devices to get to library resources on demand, more users will start to use them on a regular basis for this purpose.

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