

# Technical Report: Results From the Study: Student Use of Digital Learning Materials: implications for the NSDL

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Draft 1.2

## Introduction

This technical report summarizes the results from a national study of students enrolled in higher education in the United States regarding student perceptions of digital resources and their utility in the service of learning and provides an in-depth analysis of the dimensions of student information seeking behavior as well as developing a set of personas that describe how students interact with digital resources. This research: Student Use of Digital Learning Materials: Implication for the NSDL, was funded by the National Science Foundation (DUE award number 1049537).

This study is the part of a larger research effort examining how instructors and students in higher education, search for and use resources found in digital libraries and more widely via the Internet. Previous research focused on how faculty members use digital libraries, in particular, National Science Digital Library ([www.nsd.org](http://www.nsd.org)). Our most recent research was aimed at understanding students' use and perceptions about digital resources, how they use (or don't use) them, why some are preferred more than others and what they perceive as the benefits or their use.

While funded by the National Science Foundation, the research spanned all disciplines, not just the sciences, mathematics or engineering. Digital resources was defined broadly and included social networking sites, sites deemed 'general interest' such as Wikipedia or Khan Academy, curated collections of materials such as BioSciNetwork or digital library collections from their own or other campuses. Use of digital resources encompassed all aspects of learning within a college environment, including conducting research for writing assignments, completing homework assignments such as problem sets, clarifying concepts or answering questions raised in lectures or through readings, seeking supplementary information or pursuing answers to students' own questions.

The questions guiding the initial phase of research regarding student use were:

- How do students use digital learning resources?
- Why do students use these resources?
- What is the impact of this use on student learning?
- What are the barriers to students' use of these materials?

Early on in the research process we found the focus on the NSDL too narrow as undergraduate students look to the Internet to find information for many reasons, such as, learning content, access to virtual learning communities or collaborative work areas and tools for analysis or help

in visualizing data. So, as the research progressed, we expanded our research questions to learn more about how students actually engage with the materials and services available through the Internet. We also sought to learn more about how undergraduates used digital resources and technology in general in order to better understand how to reach out and engage students as active learners. The research evolved to encompass the following:

- How do students search for information for coursework related questions compared to how they search for information for topics in which they had a personal interest?
- What are the primary resources that students use to find information?
- What kinds of technologies do they typically use, and what would they prefer to use?
- Do students see a value in collections of digital resources and what are the components of that value?

## Related Work

Questions associated with student learning and use technology are complex and multi-faceted requiring an examination of the broad base of literature touching on the following three areas:

- student use of technology
- student information behavior
- student learning in higher education

### *Student Use of Technology*

Current research about students' use of digital resources varies widely in approach and focus. Many studies have been completed in a K-12 setting and are thus of limited utility for understanding the use and benefits we might see in higher education (Crawford & Brown 2003; Nokelainen 2006; Project Tomorrow, YEAR, Purcell, 2012). Other studies focus on teachers' reports on student behaviors, for example, the Pew Internet & American Life Project examined how teens in middle and high school conduct digital research by surveying advanced placement and national writing project teachers (Lenhart, Arafeh, Smith, & Macgill, 2008). Purcell (2012) explored Advanced Placement and National Writing Project teachers' view of the way the digital environment impacts the research and writing habits of middle and high school students. While the population is not the same as our study population, the report does provide insight into students who will soon be entering institutions of higher education. They found mostly positive impacts, including that students had more access to information at a greater depth and breadth, that they can take advantage of educational material in multimedia formats and that they had become more self-reliant researchers. On the other hand, teachers reported that students had difficulties determining the quality of online information, that they were more easily distracted and therefore had poor time management skills, they seemed to have a diminished capacity for critical thinking and they easily 'borrowed' from the work of others.

Where undergraduate studies of student use of digital content have been done they tend to be small in scale, often focused on a single course or at a single institution (Hardy et al 2008; Khine 2006; Lau and Woods 2008; Koohang 2004; Apedoe 2007; and Borgman et al 2000). Furthermore, the small-scale, focused studies tend to be about materials that were developed specifically for a project, rather than being focused on generally available, shared and re-purposed digital learning materials, of the type commonly found through searching the internet

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and digital libraries. (De Salas & Ellis 2006; Hsin-liang & Gilok 2005). Lau & Woods (2008) used a technology acceptance model to look at user beliefs and attitudes about learning objects to assess the likelihood of their use. They found that beliefs and attitudes have a substantial influence on whether or not users are likely to use learning objects in the future, though they found that user perceptions of usefulness had a stronger influence than ease of use. Focusing on digital library use, Hong et al (2001) found students used an institutional digital library less than expected but they found both ease of use and relevance important in determining potential student use with relevance being the most important factor.

More commonly studies have focused on the combined impact of digital learning materials in the contexts of specific e-learning environments (Lam & McNaught 2006; Pavey & Garland 2004; Khine, 2006), specific technology environments (Grimes, Warschauer, & Hutchinson, 2006; MacFarlan, Bohling, Thompson & Townsend, 2006), and a particular type of pedagogy or teaching intervention (Genereux & Thompson, 2008; Manfra & Stoddard, 2008).

Broad-based studies of undergraduate student technology tend to focus on student ownership and use of specific technology tools and their general media habits and only peripherally consider student interaction with research content within a learning context, if they do so at all (Dahlstrom, 2012; Allen & Seaman, 2011; Lenhart et al, 2008; Jones 2002; Valentine & Bernhisel, 2008; Kennedy et al, 2008). In related studies Tappscott (1999) and Prensky (2001) popularized the notion of a 'net generation' and 'digital natives' where access to technology and digital content fundamentally changed how recent and future generations interact with technology and acquire information. More recent research found little evidence for these popular ideas (Bennett et al., 2008; Bullen, et al., 2009, Kirshner, 2013; Jones and Czerniewicz, 2010, McKenzie 2007, Selwyn, 2009, White and Le Cornu, 2011).

#### *Student Information Behavior*

##### [Information Literacy and Library Use](#)

Much of the literature concerning students' use of digital resources is centered in research associated with the information literacy movement. Information literacy refers to the process of identifying information sources, accessing the sources, evaluating them and using them appropriately (Julien & Barker, 2008). Much recent research focuses on students' ability to search and evaluate information and how they conduct searches (Asher, 2011: Gross & Latham, 2009; Head et. al., XXX; Purcell et al, 2012; and Lim, 2009). Caruso and Salloway, (2008) reported that students perceive themselves as very skilled or experts at information literacy skills such as Internet searching, evaluating the reliability and credibility of online sources or understanding the ethical issues surrounding digital information.

Pertinent to this study, the Project Information Literacy-PIL research (Head & Eisenberg, 2009, 2010 [list all Head articles here](#)) looks specifically at college students research abilities in two contexts: research associated with a class assignment and research that students conduct for everyday life reasons. Head and Eisenberg found that students had a difficult time starting research projects for their classes, scoping them and determining the quality of their efforts. They were not expert users of the technology nor the resources available to them on their campuses, particularly librarians. They also found that students used library resources (on and off line) for academic purposes but turned to search engines and their family and friends network for everyday life searches. Students reported that they used a variety of search strategies for course-

related versus everyday life research, finding that Google, blogs, and Wikipedia were sources to turn to for everyday life research. Often, this was conducted in open-ended format with students searching more out of curiosity and interest than with a clear direction, as they had with course-related research. Course-related research, however, proved to be more frustrating as students reported difficulty finding materials or locating resources. They also found that despite students' reputation for being avid computer users who are fluent with new technologies, that few of them used Web 2.0 application for collaborating on assignments or research. While the PIL research resulted in a description of college student behaviors, it failed to adequately control for students' disciplines, which was compounded by the nature of the research project itself. It is important for example, to consider the differences of research conducted by students in science in comparison with those in the humanities.

#### *Information Behavior*

Recently, the term 'information behavior' has come to the forefront of what previously had been described in the literature as 'information seeking' (Marchionini, 1995: 5 – 6). This research tradition provides a way into exploring student behavioral models that describe, explain and predict users' motivations for seeking information, how they go about it and what shapes the kinds of choices they make (Wilson in Savolainen, 1999b: 43). Tuominen (YEAR) expanded this view to include the social context in which individuals act.

Three types of information behavior models are relevant to this research, including those that describe models of a (mostly linear) process in which an individual starts with an assigned or perceived need that then elicits an action and a selection of sources and channels. Unfortunately these models tend to be vague with little to add about how and why specific sources and channels are chosen (Wilson, 1999; Krikelas, 1983; Ellis, and Leckie, YEAR). Another type of model focuses on the internal world of the user. Kuhlthau's (YEAR) work is most relevant here because of her focus on students and learning in which she views the process from a psychological standpoint. In this view the searcher starts from a feeling of uncertainty and ends with a sense of accomplishment; in this view little is mentioned about what circumstances might change this process. Hybrid models maintain the emphasis on process and actions but includes additional factors that shape those actions and choices. These theories add the notions of task complexity (Bystrom & Jarvelin, YEAR) orienting, and problem solving information seeking tasks (Savolainen, YEAR) and characteristics of the information seeker (Johnson, YEAR). Sandstrom, Cronin and Hert (1995) and Pirolli (XX) introduced the foraging model, which moves away from linear models introducing cost-benefit analysis to choices being made.

Information behavior models highlight factors that shape the choice of source or channel and the likely location of the drivers of these choices in the psychological and social realm. Much of the information behavior literature points out that information behavior is more similar than different. It leads to the question: what other factors or groups of factors combine to shape source choice?

#### *Student Learning*

The literature on student learning within a higher education context encompasses a huge set of research, especially when coupled with questions associated with use of technology in the learning experience. During the research process however, two areas emerged as most pertinent, research associated with learning styles and the growing focus of the research on student directed or student regulated learning.

### Student Learning Styles

The field of learning styles has received considerable attention in recent years in terms of improving teaching by expanding the repertoire instructors' pedagogical methods and tools for the classroom. Recently, Coffield et al. (2004) provided a comprehensive examination of learning styles, and noted that they are often based on little (or badly designed) research, misused by instructors and limited in what they can achieve. Coffield identified over 70 different learning styles but found only about 10 were supported by valid research methods.

Many of these learning style approaches focused on preferred modalities for learning, such as the visual, auditory, kinesthetic styles outlined by Carbo, Dunn & Dunn (1986). These styles, perhaps because they sound reasonable have become very popular, especially within a faculty development context, as a rationale for encouraging instructors to change how they teach. They have also been used, Kolb (XXXX) for example, in certain disciplines such as engineering, to support efforts to bring innovation into the classroom. On one hand, the focus on learning styles does deserve credit for getting educators to think of learners less monolithically. But, on the other hand, this focus on preferred mode for learning misses factors such as the motivational difference, or frame, that students may have on their learning. It suggests that because a student has a preference for a learning style, that he or she learns better in that mode, a claim which to date, has not been shown in the research. Nevertheless, the use of learning styles has grown, and has recently been incorporated into literature on computer-assisted learning (Graf, et al., 2008; Tseng et al, 2008)

### Self-Regulated Learning

The increase in use of technology in education has given rise to the notion of Self-Regulated Learning (SRL), that is, a process by which "learners transform their mental abilities into academic skills" (Zimmerman, 2000) and includes "any study in which individuals have primary responsibility for planning, implementing, and even evaluating the effort." (Hu, 2011). In this view of learning, students take charge of their learning in relation to their learning goals (Knowles, 1975). The underlying concepts associated with SRL are: metacognition (planning, monitoring, and evaluating personal progress against a standard, motivation to learn (engagement with learning) and self-efficacy (beliefs that one is capable of performing in such a way as to attain a goal.) (Underwood & Banyard, 2011). An underlying assumption of this view of learning is that students control their own learning, i.e., they motivate themselves to accomplish goals, direct their cognitive efforts to achieve their goals.

Often closely linked to adult education, much of the research has been conducted within the health professions and associated with specific learning strategies such as problem based learning-PBL and life-long learning (Fischer, 2001; Loyens, Magda & Rikers, 2008). Research results also suggest that SRL is a developmental process (van den Hurk et al., 1999) with more advanced students relying less on guidance when seeking information or determining what to study (Dolmans & Schmidt, 1994) that less advanced students (Zimmerman, 2002).

While not focusing specifically on SRL, Hu (2001) and Kuh (2001) link SRL to college student development and student typologies. Through their research, they claim that through a typological approach it is possible to identify distinctive groups of students who share sets of characteristics and can be useful in predicting how different groups of students approach learning or behave when encountering different aspects of college life, academic and/or social (Clark & Trow, 1966; Astin, 1993; Kuh, 1990; Kuh, Hu & Vesper, 2000; Hu & Vesper, 2000). While

most of this research was based on students attending four-year institutions and based on survey research including the annual National Survey of Student Engagement (NSSE) the results do support the hypothesis that certain groups of students are more successful because they spend their time on activities that are educationally purposeful.

## Methods

### *Focus Groups*

The research began by examining how students at two- and four-year colleges and universities find and use information resources. The main focus was on learning associated with coursework, but also encompassed more informal or personal learning situations. We began the study by conducting focus groups to investigate the way students gather, evaluate and use information via digital resources. Focus group sessions were conducted at the University of Central Florida, University of Illinois, and the University of Wisconsin, Madison (4-year research universities) and also at one Illinois community college –Parkland College. Discussion centered around students' views of digital resources and their perceived value, motivation for students to utilize digital resources, strategies and perceptions of students utilizing digital resources, and any barriers to their use.

Analysis of the focus group discussions culminated with a draft student survey, which was pilot tested with students in two courses at the University of Central Florida. In addition to question responses, students were asked to provide feedback on the question format and wording, noting any questions that they perceived were particularly confusing. This allowed for more precise refinement of the final survey and this extensive input from students provided a survey that was valid and relevant.

### *Online Survey*

The final survey consisted of demographics, academic and employment information, technology availability and use. In addition, a number of Likert-scale items were asked that focused on the comparison of how students utilized digital resources for gathering information for coursework versus gathering information for topics of interest, student motivation for studying and completing academic work, and general student preferences for the use of digital resources. See Appendix B for survey questions.

### *Sampling and Survey Administration*

An online survey administration provider (SurveyMonkey) was used allowing for a national sample. Because of the large database of participants maintained by the provider, the sample was narrowed to those within 18-31 years of age to increase the likelihood of student respondents. The anonymous nature of the participants streamlined the Institutional Review Board (IRB) process, while allowing for a large sample of students attending a wide variety of two- and four-year public and private colleges, as well as those formally or never attending college.

## Summary of Results

### *Focus Groups*

Is this summarized somewhere? Do we need to say anything?

### Online Survey

In this report, we provide an overview to the results of the survey, providing a description of the respondents and their opinions regarding the use of technology in colleges and universities, their views about how they use technology and online resources to learn in both formal (school or work) and informal learning (seeking information about an interest) circumstances. Additional questions queried respondents about opinions and use of Wikipedia and other collections of online resources, particularly those organized by (but not limited to) libraries. Appendix XX provides a comparative look at the opinion-based questions on the variables such as gender, age, student status (full/part time) and type of institution.

### Demographics

Table 1: Region of Residence

	f	%
New England (Connecticut, Main, Massachusetts, New Hampshire, Rhode Island, Vermont)	98	5.9
Middle Atlantic (New Jersey, New York, Pennsylvania)	227	13.7
East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin)	279	16.9
West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota)	154	9.3
South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia)	262	15.9
East South Central (Alabama, Kentucky, Mississippi, Tennessee)	84	5.1
West South Central (Arkansas, Louisiana, Oklahoma, Texas)	140	8.5
Mountain (Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Wyoming)	127	7.7
Pacific (Alaska, California, Hawaii, Oregon, Washington)	271	16.4
International	9	0.5
Total	1651	99.9

Responses by individual state can be found in Appendix XX

Table 2: Gender

	f	%
Male	1020	58.9
Female	712	41.1
Total	1730	100.0

Table 3: Ethnicity

	f	%
African American/Black	92	5.3
American Indian	10	0.6
Asian	92	5.3
Hispanic/Latino	138	7.9
Native Hawaiian/Pacific Islander	6	0.3
White/Caucasian, non-Hispanic	1,272	73.3
Multiracial	68	3.9
Prefer not to say	38	2.2
Other	20	1.2

<b>Total</b>	1,736	100.00
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Table 4: Age

	f	%
18-19	331	21.5
20-21	304	19.7
22-23	276	17.9
24-25	252	16.3
26+	378	24.5
<b>Total</b>	1541	99.9

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Table 5: Highest academic degree attained by either Parent or Caregiver

	f	%
Did not complete high school	43	2.5
High school diploma or GED	448	25.8
AA/AS	212	12.2
BA/BS	534	30.7
Master's degree	316	18.2
Ph.D. or Ed.D.	67	3.9
Medical degree	43	2.5
Law degree	47	2.7
Other	27	1.6
<b>Total</b>	1737	100.1

Table 6: Student Status

	f	%
A full-time college/university student	920	52.6
A part-time college/university student	155	8.9
A former college/university student	539	30.8
Never a college/university student, and not currently a student	135	7.7
<b>TOTAL</b>	1749	100.0

Table 7: State of most recently attended educational institution

	f	%
New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont)	114	7.3
Middle Atlantic (New Jersey, New York, Pennsylvania)	195	12.4
East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin)	279	17.8
West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota)	145	9.2
South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia)	229	14.6
East South Central (Alabama, Kentucky, Mississippi, Tennessee)	84	5.4
West South Central (Arkansas, Louisiana, Oklahoma, Texas)	128	8.2
Mountain (Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Wyoming)	113	7.2
Pacific (Alaska, California, Hawaii, Oregon, Washington)	243	15.5
International	25	1.6



<b>Online institution</b>	13	0.8
<b>TOTAL</b>	1568	100.0

List of individual schools respondents found in Appendix XX

Table 8: Type of most recently attended or currently attending institution

	f	%
2 year/community college	251	16.1
4 year college/university	964	61.8
Trade or tech school	34	2.2
Comprehensive or research university	262	16.8
An online institution	10	0.6
I do not know	9	0.6
None of the above	29	1.8
<b>TOTAL</b>	<b>1559</b>	<b>99.9</b>

Table 9 – GPA – did anyone summarize this? Open ended

Table 10: College major

	f	%
Biological/life sciences, including agriculture	122	7.8
Health sciences, including nursing	137	8.8
Vocational or technical programs, e.g. automotive, culinary arts	25	1.6
Business, management, marketing	242	15.4
Education, including physical education	93	5.9
Engineering, including computer science	176	11.2
Humanities, including history and liberal arts	104	6.6
Physical sciences, including math	48	3.1
Social sciences, including psychology	208	13.3
Fine arts	79	5.0
Undecided	83	5.3
Other	248	15.8
<b>TOTAL</b>	<b>1567</b>	<b>99.8</b>

Table 11: Highest academic degree attained by respondent

	f	%
High school diploma or GED	109	20.9
Associate's degree (AA/AS)	50	9.6
Bachelor's degree BA/BS	260	49.8
Master's degree	70	13.4
Ph.D. or Ed.D.	5	1.5
Medical degree	2	0.4
Law degree	11	2.1
Other	12	2.3
<b>Total</b>	<b>522</b>	<b>100.0</b>

Table 12: Academic Standing

	f	%
Freshman	252	24.2
Sophomore	246	23.6
Junior	188	18.1
Senior	201	19.3
Graduate	126	12.1
Other	28	2.7
<b>Total</b>	<b>1041</b>	<b>100.0</b>

Table 13: Place of Residence While Attending College or University

	f	%
On campus housing (e.g., dorm, Greek house, etc.)	386	37.1
Off campus with family	264	25.4
Off campus with spouse/significant other/partner	139	13.4
Off campus with friends	174	16.7
Off campus living alone	78	7.5
<b>Total</b>	<b>1,041</b>	<b>100.1</b>

Table 14: Hours employed per week

	f	%
0, I'm not working	422	40.5
1-9 hours	145	13.9
10-19 hours	183	17.5
20-29 hours	126	12.1
30-39 hours	70	6.7
40+ hours	97	9.3
<b>TOTA:</b>	<b>1043</b>	<b>100.0</b>

*Attitudes towards school, information seeking and technology*

Table 15: Level of agreement regarding the value of higher education

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
The discipline I pursued/am pursuing in school is important. (n = 1565)	2.9% (45)	1.3% (21)	5.4% (84)	34.8% (544)	55.6% (871)
My educational institution did/is doing a good job preparing me for the future. (n = 1562)	3.6% (56)	6.0% (94)	13.1% (204)	44.7% (698)	32.6% (510)
Hard work as a student has paid off/will pay off in my career. (n = 1559)	4.2% (66)	6.0% (94)	13.0% (203)	28.9% (450)	47.8% (746)
My educational institution has a good reputation. (n = 1525)	2.7% (41)	3.3% (51)	10.4% (158)	38.5% (587)	45.1% (688)
I have had/I think I will have a big impact on my field. (n = 1555)	6.7% (104)	10.5% (164)	27.8% (432)	31.6% (492)	23.3% (363)

Table 16: Resources assigned by faculty or instructors for use in classes

	f	%
video or audio related course content	791	81.5
Course wikis and blogs	260	26.8
E-books or e-textbooks	440	45.3
Simulations, animations or online games related to course content	257	26.5
Mobile apps related to course content	57	5.9
Content from websites outside of your campus	664	68.34
Social networking technologies, e.g., Twitter, Facebook, Ning	207	21.3
Online library resources, e.g., e-reserves, online journals or subject guides	742	76.4
<b>Total</b>	<b>971</b>	

Table 17: Preference for use of technologies in class or assignments

	n	$\bar{x}$	SD	Never	Seldom	Sometimes	Frequently
video or audio related course content	1000	3.19	0.74	3.1% (31)	9.9% (99)	51.5% (515)	35.5% (355)
Content from websites outside of your campus	1000	3.06	0.79	4.2% (42)	15.6% (156)	50.1% (501)	30.1% (301)
Simulations, animations or online games related to course content	994	2.79	0.98	13.9% (138)	19.4% (193)	40.6% (404)	26.1% (259)
E-books or e-textbooks	998	2.73	0.97	13.2% (132)	24.3% (243)	38.6% (385)	23.8% (238)
Course wikis and blogs	994	2.35	0.92	20.5% (204)	35.0% (348)	33.8% (336)	10.7% (106)
Social networking technologies, e.g., Twitter, Facebook, Ning	995	2.20	1.03	32.7% (325)	27.8% (277)	26.8% (267)	12.7% (126)
Mobile apps related to course content	992	2.19	1.03	32.1% (318)	29.5% (293)	25.3% (251)	13.1% (130)

Table 18: Modality of majority of course vs. preferred modality.

	Modality Used in classes		Class Modality Preferred	
	f	(%)	f	(%)
Entirely face-to-face	454	45.3	3.98	39.8
Minimal use of the Web, mostly held in face-to-face format	358	35.7	313	31.3
An equal mix of face-to-face and Web content	117	11.7	203	20.3
Extensive use of the Web, but still some face-to-face class time	25	2.5	44	4.4
Entirely online with no face-to-face time	45	4.5	40	4.0
<b>Total</b>	<b>999</b>		<b>998</b>	

Table 19: Steps taken in past year to reduce amount spent on textbooks and other instructional materials

	f	%
Shared a textbook with a friend	351	37.5
Did not buy a text for a class	398	42.5
Use a textbook from the library instead of buying one	218	23.3
Rented a textbook	424	45.3
Borrowed a textbook	321	34.3
Found materials online to take the place of a textbook	364	38.9
Other	164	17.5
<b>Total</b>	<b>936</b>	

Table 20: Concern about ability of current students to finance their college education

	f	%
<b>Extremely concerned</b>	510	33.6
<b>Very concerned</b>	356	23.4
<b>Somewhat concerned</b>	348	22.9
<b>A little concerned</b>	163	10.7
<b>Not concerned at all</b>	143	9.4
<b>Total</b>	1520	

Table 21: Students Information Seeking Behaviors: Class

	n	$\bar{x}$	SD	Very Unlikely	Somewhat Unlikely	Unsure	Somewhat Likely	Very Likely
<b>Seek out faculty and TAs</b>	986	3.88	1.13	4.6% (45)	10.5% (104)	11.3% (111)	39.5% (389)	34.2% (337)
<b>Seek out friends</b>	983	4.19	1.01	2.7% (27)	6.1% (60)	8.0% (79)	35.8% (352)	47.3% (465)
<b>Seek out tutor or the learning center</b>	981	3.17	1.28	12.2% (120)	22.1% (217)	17.8% (175)	31.8% (312)	16.8% (157)
<b>Post question on an Internet message board</b>	984	2.78	1.39	25.4% (250)	20.7% (204)	16.5% (162)	25.0% (246)	12.4% (122)
<b>Text or IM friends</b>	982	3.69	1.29	10.1% (99)	10.8% (106)	10.5% (103)	37.8% (371)	30.9% (303)
<b>Email experts not at your institution</b>	983	2.30	1.33	38.8% (381)	23.5% (231)	15.6% (153)	13.6% (134)	8.5% (84)
<b>Consult textbooks</b>	983	4.48	0.82	1.5% (15)	2.4% (24)	5.0% (49)	28.7% (282)	62.4% (613)
<b>Ask a librarian</b>	981	2.44	1.31	32.7% (321)	23.5% (231)	15.6% (153)	13.6% (134)	8.5% (84)
<b>Consult supplemental readings</b>	985	3.72	1.17	7.0% (69)	9.5% (94)	15.6% (154)	40.2% (396)	22.7% (223)
<b>View an online lecture</b>	982	3.45	1.28	10.9% (107)	14.0% (137)	16.8% (165)	35.6% (350)	22.7% (272)
<b>Review relevant Wikipedia entries</b>	982	3.81	1.30	9.9% (97)	8.6% (84)	10.5% (103)	32.6% (320)	38.5% (378)
<b>Review results from a Google search</b>	979	4.32	0.92	2.2% (22)	3.6% (35)	7.0% (69)	34.1% (334)	53.0% (519)
<b>Use online library resources (e.g. online journals, e-reserves or subject guides)</b>	981	3.82	1.14	4.6% (45)	11.3% (111)	14.0% (137)	37.7% (370)	32.4% (318)

Table 22: Students Information Seeking Behaviors: Interest in a topic

	n	$\bar{x}$	SD	Very Unlikely	Somewhat Unlikely	Unsure	Somewhat Likely	Very Likely
Seek out faculty and TAs	960	3.26	1.42	16.1% (155)	18.6% (179)	11.6% (111)	30.2% (290)	23.4% (225)
Seek out friends	960	3.50	1.33	10.8% (104)	16.1% (155)	11.8% (113)	34.5% (331)	26.8% (257)
Seek out tutor or the learning center	959	2.31	1.32	37.0% (355)	25.4% (244)	15.8% (152)	12.7% (122)	9.0% (86)
Post question on an Internet message board	956	2.69	1.42	29.8% (285)	18.8% (180)	15.6% (149)	23.7% (228)	11.9% (114)
Text or IM friends	959	3.14	1.41	19.0% (182)	16.4% (157)	16.5% (158)	28.5% (273)	19.7% (189)
Email experts not at you institution	956	2.63	1.40	30.6% (293)	20.4% (195)	16.5% (158)	20.6% (197)	11.8% (113)
Consult textbooks	957	3.85	1.23	8.2% (78)	8.3% (79)	10.7% (102)	36.8% (352)	36.2% (346)
Ask a librarian	958	2.57	1.39	31.3% (300)	21.8% (209)	16.6% (159)	19.1% (183)	11.2% (107)
Consult supplemental readings	957	3.87	1.22	7.9% (76)	7.8% (75)	10.9% (104)	35.7% (342)	37.6% (360)
View an online lecture	958	3.51	1.34	11.7% (112)	13.4% (128)	16.0% (153)	30.6% (293)	28.4% (272)
Review relevant Wikipedia entries	959	4.13	1.21	7.1% (68)	5.9% (57)	7.4% (71)	26.2% (251)	53.4% (512)
Review results from a Google search	955	4.54	0.83	1.5% (14)	2.4% (23)	5.8% (55)	21.5% (205)	68.9% (658)
Use online library resources (e.g. online journals, e-reserves or subject guides)	956	3.75	1.27	8.3% (79)	10.4% (99)	15.8% (151)	29.2% (279)	36.4% (348)

Table 23: Respondents Information Seeking Behaviors: Work

	n	$\bar{x}$	SD	Very Unlikely	Somewhat Unlikely	Unsure	Somewhat Likely	Very Likely
Seek out friends	643	3.78	1.13	5.1% (33)	12.9% (83)	8.4% (54)	47.0% (302)	26.6% (171)
Seek out an expert	642	4.04	1.04	3.0% (19)	7.8% (50)	11.1% (71)	38.6% (248)	39.6% (254)
Post question on an Internet message board	642	2.88	1.35	21.2% (136)	22.6% (145)	16.2% (104)	27.6% (177)	12.5% (80)
Text or IM friends	640	3.11	1.36	16.9% (108)	20.9% (134)	13.1% (84)	32.8% (210)	16.3% (104)
Email experts	642	3.61	1.24	8.3% (53)	13.3% (85)	14.2% (91)	37.6% (241)	26.7% (171)
Consult books/textbooks	645	4.21	1.01	2.6% (17)	5.7% (37)	9.1% (59)	32.9% (212)	49.6% (320)
Ask a librarian	641	2.38	1.31	35.1% (225)	23.6% (151)	17.5% (112)	16.2% (104)	7.6% (49)
View an online lecture	639	3.38	1.28	11.6% (74)	14.7% (94)	17.4% (111)	36.5% (233)	19.9% (127)
Review relevant Wikipedia entries	641	3.77	1.31	10.8% (69)	8.4% (54)	10.8% (69)	33.9% (217)	36.2% (232)
Review results from a Google search	644	4.36	0.91	2.2% (14)	3.3% (21)	6.7% (43)	32.5% (209)	55.4% (357)
Use online library resources (e.g. online journals, e-reserves or subject guides)	644	3.79	1.24	7.9% (51)	8.9% (57)	16.0% (103)	30.9% (199)	36.3% (234)

Table 24: Respondents Information Seeking Behaviors: General Interest

	n	$\bar{x}$	SD	Very Unlikely	Somewhat Unlikely	Unsure	Somewhat Likely	Very Likely
Seek out friends	639	3.47	1.26	10.0% (64)	16.0% (102)	11.4% (73)	42.1% (269)	20.5% (131)
Seek out an expert	636	3.01	1.35	17.5% (111)	23.1% (147)	16.7% (106)	26.8% (170)	15.9% (101)
Post on Internet message board	637	2.74	1.38	25.7% (164)	22.0% (140)	16.3% (104)	24.3% (155)	11.6% (74)
Text or IM friends	638	3.03	1.35	18.8% (120)	19.6% (125)	15.7% (100)	32.0% (204)	13.9% (89)
Email experts	637	2.81	1.36	23.2% (148)	22.1% (141)	18.2% (116)	23.9% (152)	12.6% (80)
Consult books/textbooks	635	3.70	1.28	8.7% (55)	12.3% (78)	12.3% (78)	34.0% (216)	32.8% (208)
Ask a librarian	634	2.24	1.30	40.5% (257)	23.3% (148)	15.0% (95)	14.5% (92)	6.6% (42)
View online lecture	637	3.24	1.37	15.7% (100)	16.8% (107)	15.4% (98)	31.6% (201)	20.6% (131)
Review relevant Wikipedia entries	637	4.10	1.18	6.1% (39)	7.5% (48)	6.6% (42)	30.5% (194)	49.3% (314)
Review results from a Google search	640	4.52	0.87	2.3% (15)	2.2% (14)	4.2% (27)	24.1% (154)	67.2% (430)
Use online library resources	636	3.54	1.36	11.8% (75)	13.8% (88)	13.5% (86)	29.9% (190)	31.0% (197)

Table 25: Ownership, access to, or plan to purchase in the next year?

	Own		Have access		Plan to purchase	
	f	%	f	%	f	%
Computer, laptop, or netbook	1,478	85	248	14	87	5
iPad	208	12	277	16	213	12
Other tablet device, e.g. Galaxy Tab or Xoom	116	7	170	10	133	8
eReader, e.g. Kindle or Nook	342	20	256	15	150	9
iPhone	431	25	202	12	190	11
Other smartphone, e.g. Android, Blackberry, etc.	616	35	185	11	112	6

Table 26: Use of Wikipedia when working on a paper/assignment for class or when doing a project for work?

	f	%
Yes	915	56.5
No	704	43.5
Total	1,619	



Table 27: Wikipedia use

	f	%
Background information	847	92.8
Citations to other resources	490	53.7
Explanation of complex concepts	652	71.4
Other	79	8.7

Table 28: Reasons for not using Wikipedia

	f	%
Company policy against it	74	10.6
Do not trust the accuracy of the information	496	71.2
Never heard of it	13	1.9
Not enough detail	169	24.2
Class or institutional policy against it	304	43.6
Better resources available	481	69.0
Not appropriate for my subject matter	134	19.2
Other	57	8.2

Table 29: Student directedness and/or motivation for learning

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
I solve problems using a plan. (n = 1,594)	1.1% (17)	5.2% (83)	9.2% (147)	57.1% (910)	27.4% (437)
I am systematic in my learning. (n = 1,592)	1.4% (23)	8.8% (140)	15.8% (251)	50.3% (800)	23.7% (378)
I prefer to set my own learning goals. (n = 1,592)	1.0% (16)	5.2% (83)	15.2% (242)	47.3% (753)	31.3% (498)
I will alter my practices when presented with new information. (n = 1,590)	0.6% (9)	4.0% (63)	16.1% (256)	52.0% (827)	27.4% (435)
When presented with problems I cannot solve, I will ask for assistance. (n = 1,591)	1.1% (18)	6.5% (104)	9.8% (156)	46.4% (739)	36.1% (574)
I am confident in my ability to search. (n = 1,588)	0.3% (5)	2.0% (31)	5.8% (92)	39.6% (629)	52.3% (831)
I enjoy studying. (1,589)	11.0% (175)	21.1% (335)	19.3% (307)	32.3% (513)	16.3% (259)
I have a need to learn. (n = 1,587)	0.9% (14)	3.7% (58)	11.8% (188)	43.6% (692)	40.0% (635)
I set specific times for studying. (n = 1,588)	13.4% (212)	29.8% (473)	19.0% (310)	25.3% (402)	12.6% (200)

Table 30: Student measures of the value of collections and collectedness

	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
When I identify a site with valuable resources, I explore it further to determine whether there are additional related materials. (n = 1,589)	0.8% (12)	4.1% (65)	9.6% (152)	50.4% (801)	35.2% (559)
I prefer to search large, wide-ranging collections (ex: YouTube) over more narrowly-focused collections related to one or a few topics, because large collections are more likely to have what I need, even if it takes more time. (n = 1,588)	3.0% (48)	20.2% (321)	26.5% (421)	33.8% (536)	16.5% (262)
I prefer searching one large resource first when I don't know where to look. (n = 1,589)	1.3% (20)	3.8% (60)	13.2% (210)	52.6% (815)	29.1% (460)
I appreciate when other people create subcollections of materials from large collections related to a specific topic. (n = 1,586)	0.4% (6)	2.3% (36)	16.7% (264)	51.5% (815)	29.1% (460)
I prefer sites where others have determined the reliability/accuracy of the content versus those where I have a broad choice but have to do some work in determining reliability and accuracy of the resources. (n = 1,586)	1.1% (17)	5.8% (92)	17.0% (270)	43.9% (696)	32.2% (511)
I prefer collections of materials that allow me to participate in building or adding to the resource. (n = 1,585)	6.2% (99)	23.5% (373)	35.1% (556)	24.8% (393)	10.3% (164)

### Preliminary Findings

The aim of this research is to provide insight into how students search for and use online information in the service of their learning. The focus of this study is on answering the following set of research questions.

- How do students search for information for coursework related questions compared to how they search for information for topics in which they had a personal interest?
- What are the primary resources that students use to find information?
- What kinds of technologies do they typically use, and what would they prefer to use?

Flora McMartin 5/22/14 11:28 AM

**Comment [3]:** GM can't find much of interest in this whole notion – dump in next survey

JM if we were going to do a follow up in terms of library – do focus groups – understanding geographies or conceptions of search

FM: this is not meaningful to anyone any more –

GM: in terms of finding info – people who think they are AAA and you need a triptik but everyone else has found their own sort of ways. You are Here philosophical stuff – these are old books – how we interpret actual maps very tied to memory and emotional stuff. How people find things is very personal, memory, identity and stuff like that.

ACRL study on students doing research: students redesign webpage – they wanted a way to order pizza when they are studying –

- Do students see a value in collections of digital resources and what are the components of that value?

The results of the study to date indicate that:

- How students view, relate to and use digital resources is a nuanced picture that stands in sharp contrast to the widely held “digital native” one-size-fits-all model that has been promoted widely in the popular press, IT professional organizations and from the experience of an older generation of users.
- Student ambivalence towards technology seems to be more common than anticipated; campus faculty and staff need to address this. Reported usage is already quite low for all but the most common technologies, but student preferences for using technology in class is significantly lower.
- Following on this, there is enormous potential for students to learn and supplement their learning from technology. But it would seem that there is a system of haves and have-nots emerging in terms of those students who can use digital resources to supplement their learning and those who can't or won't.
- Librarians and other (non-faculty) experts are last on the lists of where students go to for help either for classwork or for interest. It appears that students are not willing or interesting in asking “strangers” for help. This finding refutes arguments such as those made by Anya Kamenetz (2010) in DIYU that a large part of informal learning is going to be students asking experts in the field and learning from them.
- The preference for textbooks is striking – especially given the concerns about costs and the different steps students take to avoid buying textbooks.
- Students don't like fully online courses and by only a very bare majority like blended. This finding has implications for those colleges/universities ramping up fully online courses. More research is required to learn more about these preferences and who holds them.
- Wikipedia and Google use is especially important to students who are getting a start on using digital resources and both are frequent entry points for learning about a new topic. Contrary to popular thought often expressed by faculty, students review findings carefully to determine their validity and usually extend their search for information on a topic from that source.

### Future Work

The data set resulting from this survey is large and provides opportunity for more comparative analysis. The preliminary results and early findings have provided the researchers with several paths for analyzing the data. In fall of 2012, the data were analyzed in an effort to understand the dimensionality of student information seeking behavior, that is, how students structure how they look for and use digital resources. Second latent class analysis was used to construct a set of personas to describe how students use and interact with digital resources in their learning. The results of these analyses are reported elsewhere, including:

ELA, Educause citations

Flora McMartin 5/23/14 4:03 PM

**Comment [4]:** PM: Careful about this term, can't or won't is important here –

Winners or losers; be careful here.

Some of both, we don't know how to separate chosers from those who don't really have access

JM: is there literature that says here's the: ideal search strategy – e.g., we need to encourage forage, is there a blueprint? Are any of them affective? Coming from lib. lit. that has really narrow view of what's good.

AW: I know where to go get stuff aside from the place, e.g., google scholar – can we write a paper that says here how to search?

PM/GM: we won't win friends – they are teaching info. Fluency wrong – you must start w/ data bases, there's the Library issue here – they aren't adapting to the way it is now.

JM We have way to put a different lens - infomraiton pragmatism - we need to engender that in students, it may not be the best,

GM: we need to write 'the naked roommate' - you go to google, these are some tricks you might do. Even librarians do it - student standpoint: If I can get the A paper going to google scholar, then why do the 'appropriate' search strategy.

## Acknowledgements

### Citations

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### Appendices

*Appendix A: Focus group protocol*

*Appendix B: Survey questions*

*Appendix C: Survey Results by Selected Demographics*