"How do I send an Email?"
Technology Challenges for First-Year Students in the College Library

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Abstract

Purpose – The purpose of this paper is to identify the ability of college freshmen to successfully use common academic software and manage files.

Design/methodology/approach – In total, 39 college freshmen from three college campuses were recruited for the study. An online test environment and screen recording software were used to measure student proficiency in using PDFs, Microsoft Word, Microsoft PowerPoint, Microsoft Excel, Gmail, and Windows. Data were collected in September 2013.

Findings – Student use of academic technology is common, but their software skills are not comprehensive or deep. Students were most proficient at using PDFs and Microsoft Word. Microsoft Excel tasks were the most difficult for the students, and many struggled to use Gmail to compose a message and send an attachment. Students were able to open a PowerPoint document and view a slideshow, but they were less comfortable navigating the software's printing environment.

Originality/value – Having concrete data about student technology skills, rather than anecdotal data from reference desk interactions, can help librarians design improved instruction and tutorials that target areas of student technology weakness.

Keywords Academic libraries, Students, Software tools, Reference services, Computer software, Electronic mail

Paper type Research paper

Introduction

Since 2004, the Educause Center for Analysis and Research (ECAR) has performed an annual study of undergraduate students and their information technology experiences and preferences. One of the top nine findings from the 2014 ECAR Study of Undergraduate Students and Information Technology was that "Students' academic use of technology is widespread but not deep" (Dahlstrom and Bichsel, 2014, p. 4). This finding can be confirmed at the reference desk in any academic library in the USA, where librarians have grown accustomed to answering questions about technology in addition to more traditional research-focussed questions.

Over the past five years, librarians at three academic campuses in the North-eastern USA have observed a persistent and increasing number of student technology questions, often coming from students considered to be "Digital Natives" (Prensky, 2001). These students, though proficient in social and/or entertainment technology, e.g. gaming, Instagram, iTunes, etc., seem to lack the basic technology skills expected by their professors, including skills related to saving and organizing files, creating and editing Microsoft Word documents, using e-mail effectively, and managing Microsoft PowerPoint and Excel assignments. The type and consistency of student questions at

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the information desk led the authors to question whether or not the faculty expectation of student technology skill levels was realistic.

The authors designed a performance-based online assessment to gather quantitative, rather than anecdotal, data about student strengths and weaknesses in using academic technology. Without this data, it is difficult to create targeted, clear, and accessible tech support options. Librarians need to know the precise way in which students struggle with academic technology before they can improve their support for these students.

Literature review

ICT assessment

There are several fee-based tools available to measure student academic software proficiency, most of which require campus licenses. The Educational Testing Service (ETS) offers a product called iSkills that tests the ability of students to "adapt, apply, design or construct information in digital environments" and includes sections that require participants to edit and format a document according to a set of editorial specifications and create a presentation slide to support a position on a controversial topic (iSkills, 2014). iSkills also tests student ability to navigate e-mail, manage files, and use Word processing, spreadsheets, and presentation software (iSkills, 2014). Another online skill-based test, Cengage Learning's Skills Assessment Manager (SAM) has been used by college campuses to assess student computer skills. Colleges that have used the SAM test include Indiana State, West Texas A&M University, Xavier University, and the University of Oklahoma (Wilkinson, 2010; Tesch *et al.*, 2006). The company International Computer Driver's License (ICDL) offers a product called European Computer Driver's License (ECDL)/ICDL, and while it is designed for corporate training, it can also be used to assess computer literacy by simulating a work environment in which students are required to perform tasks in Microsoft Word, Excel, Access, and PowerPoint (Csapo, 2002, cited in Wilkinson, 2010). In his 2008 study of freshman and senior education majors at University of Wisconsin-Stout, Sveum used Certiport's IC^3 performance-based assessment tool. Some institutions, such as the University of Texas at Arlington, designed their own in-house computer proficiency examinations (Cardell and Nickel, 2003).

Student technology skills

There have been many articles published that describe the student technology test scores and how that reflects on student ability to successfully use academic software (Dickerson, 2005; Wilkinson, 2010; Sveum, 2010). However, none of these studies address the specific tasks with which students struggle, and where they are more successful. Without analysis of the ways in which students misuse or misunderstand standard academic technology, attempts by librarians, faculty, and other college support staff to remediate the problems remain shots in the dark. Though each student brings his or her own personal technology abilities and deficiencies to the table, this study attempts to shed light on common technology questions and problems seen regularly at the college library reference desk.

Methodology

Participants

The study focussed on first-year students because of the persistent assumption by college faculty and librarians that students come to college knowing how to use

academic technology. The authors recruited a total of 39 first-year students from three college campuses: Genesee Community College (GCC) in Batavia, New York; Penn State Altoona, and Penn State Shenango, both of which are four-year schools in the Penn State University system. Unlike GCC and Penn State Altoona, whose FTE are both predominantly traditional aged students, or students younger than 24 years of age, Penn State Shenango's student body is made up of 60+ percent non-traditional students, or students older than 24. The 15 students recruited at Penn State Shenango were specifically pulled from that group, in order to compare native computer skills between older and younger students between the campuses. The 24 students participants from GCC and Penn State Altoona were not selected by age, although that information was deliberately captured as part of one of the tasks performed during the study. Review of the data showed that 23 of the 24 GCC and Altoona students fell into the traditional student age range. The authors deliberately chose to focus on age as the only defining demographic characteristic for the study, and refrained from capturing any additional information about the participants.

Librarians at the three campuses publicized the study both at tables in the library and as announcements in campus classes. Students volunteered to participate in the study, and all received a $10 gift card for their participation. The Penn State Institutional Review Board approved the study for Penn State Altoona and Shenango, and, in addition, the study was approved by GCC's Institutional Research Office. The study participants received an implied consent form at the start of their individual research session, and they were given the opportunity to ask questions or withdraw their participation at any point during the session.

Procedures

Because the authors did not have college-level access to a standardized computer literacy assessment tool like iSkills or SAM, they designed their own performance-based online instrument to assess student proficiency in using PDFs, Microsoft Office software, e-mail, and file management. The authors created a series of tasks to be performed by the participants and recorded this performance using screen capture technology. The list of tasks was compiled by tabulating the most common technology questions asked at the reference desks in the three college libraries (the Appendix). The tasks were separated into four main categories: using PDFs, Word, PowerPoint, and Excel. Within each category, the tasks were designed to test not only the participants' proficiency at using that software, but also their ability to manage files, maneuver in a Windows environment, and use e-mail effectively. All three campuses use Windows, rather than Mac, as the standard environment in all campus labs, including the library.

The authors at the two Penn State campuses used TechSmith's Morae software to administer the assessment tool and to record the results. The author at GCC used the same list of tasks used by the Penn State authors, but because the GCC campus does not have a license for Morae, the author used the campus library's LibGuides account to create a private online version of the task list and recorded the participants' actions using Techsmith's Camtasia software.

The data were collected during September 2013. The authors chose to collect the data early in the semester in order to capture a realistic picture of the technology skills of incoming freshmen, before they progressed too far into their first semester. To collect

the data, each participant was scheduled to come to the research room at each campus at a specific time, at which point they were seated at a computer and were given instructions. They were informed that their screen actions would be recorded, but they would not be recorded in any other way, including video or audio, which preserved their anonymity. The time needed for data collection was about 20 minutes. Students could perform the tasks using their own preferred method. For example, students were asked to add content to the header of a Word document. Successful completion of this task could be achieved by using the Insert Ribbon in Word, or by right clicking at the top of the page in Print Layout and choosing "insert header," etc. After all of the participants' data were collected, the authors reviewed the screen capture videos, graded the participants' ability to successfully complete the technology tasks, and noted the diverse ways in which the participants interacted with the software.

Results and discussion

Success rate

Participants were most successful at the PDF and the Word tasks. In total, 23 out of 39, or 59 percent, completed all three of the PDF tasks correctly, and only three participants failed to complete any of the tasks correctly. In total, 27 out of 39, or 69 percent, completed either three out of four Word tasks correctly, or all of the tasks. Only two students failed to complete any of the Word tasks correctly. Participants were least successful at completing the Excel tasks, with 22 out of 39, or 56 percent, failing to complete either of the two tasks. For the PowerPoint section, five students were unable to complete any of the tasks, but the rest of the results were fairly evenly distributed, with 36 percent completing one task correctly, 26 percent completing two out of three tasks, and 26 percent completing all of the tasks correctly (Table I).

Table I. Task completion success rate

Task 1 – PDFs					
	None right	1 Right	2 Right	All Right	
GCC		1	1	7	
Penn State Altoona			4	11	
Penn State Shenango	3	1	6	5	
Task 2 – Word					
	None right	1 Right	2 Right	3 Right	All Right
GCC		1	1	5	2
Penn State Altoona		1	2	7	5
Penn State Shenango	2	4	1	5	3
Task 3 – PowerPoint					
	None right	1 Right	2 Right	All Right	
GCC	1	5	2	1	
Penn State Altoona		6	4	5	
Penn State Shenango	4	3	4	4	
Task 4 – Excel					
	None right	1 Right	All Right		
GCC	6	1	2		
Penn State Altoona	5	4	6		
Penn State Shenango	11	1	3		

Task competence

The easiest task for the participants was opening and printing the PDF. The students were also successful at opening the Word document, typing a few sentences, and saving the document. Both of the Excel tasks were challenging for the participants (Table II).

Software competence

The results of this study were similar to those of several other student technology studies completed over the past decade. Table III compares the results of this study with Wilkinson's, 2010 "Students Computer Literacy" study results from 91 students (*W* score), Dickerson's study of 186 juniors and seniors in 2005 (*D* score), and Sveum's assessment of 23 freshmen in 2008 (*S* score). Although the computer literacy assessment tools in the studies varied from SAM to IC^3 to this study's homegrown tool, the results are similar. The highest comparable mean scores for any of the sections were Dickerson's 65.75 for PowerPoint, which was the result for the SAM test for upper-level students at the University of North Carolina at Wilmington, and the GCC/Penn State Word mean score of 67.31. The higher Word score may indicate an improved familiarity of college freshman with Word over the past decade, or the difference could be a result of the different questions posed by the variety of assessment tools.

From a review of these score means, it is clear that first-year students consistently struggle with common academic technology, and upper-level students did not score significantly higher in tests similar to those given to college freshmen.

Word

Most of the participants were able to open the required Microsoft Word document, type several sentences, and save it. But not all of the Word tasks were this easy for the participants. They consistently ran into trouble when navigating the header/footnote tasks. Totally, 69 percent were unable to complete the task, however, 13 of the

Section	Easiest tasks	Most difficult tasks
PDFs	Open and print PDF = 92% success	E-mail PDF as attachment = 36% failed
Word	Open the file, type, save = 92% success	Put your hometown in a footnote = 69% failed
PowerPoint	Open file and view as slideshow = 85% success	Print 3 slides to a page = 62% failed
		Print slide with notes = 56% failed
Excel	NA	Use a formula to add = 67% failed
		Create a pie chart = 54% failed

Table II. Easiest and most difficult tasks

Section	GCC/Penn State score means[a]	*W* score means*	*D* score means*	*S* score means*
PDFs	79.49	NA	NA	NA
Word	67.31	56.14	58.66	51.61 (word processing)
PowerPoint	54.70	59.36	65.75	43.48 (presentations)
Excel	35.90	51.34	29.89	42.87 (spreadsheets)

Note: *Scores are out of 100 points

Table III. Mean scores GCC/ penn state vs other studies

27 students who failed may have been confused by the terminology, as they put the name in a footer instead of a footnote. The authors found that students who located the insert footnote icon on the tool ribbons largely did so by trial and error, clicking on each of the indexing tabs. None made a direct connection that footnote information would fall under the "References" tab.

Excel

Excel was the most difficult section for all of the study participants, with a mean score of 35.90. The authors were not surprised by this result. In preparing for the study, consultation with the director of Technology Tutors at the Penn State University Park campus confirmed that the tutors in that location were asked questions about Excel more often than any other academic technology. The director noted that the three areas with which students struggled the most were creating charts and graphs, using formulas, and creating pivot tables. The authors focussed on the first two problem areas for this study because pivot table questions were less frequent than questions about formulas and charts/graphs at the library reference desks.

As previously mentioned, only 33 percent of participants were able to use a formula to add a column of numbers. Review of the participant session recordings showed that several participants manually added the numbers and typed in the total, and others quit without trying to answer the question. More than half of the participants were unable to create a pie chart. Several students found the pie chart option in the Excel toolbar and clicked on it, but they were unable to connect the tool to their data by highlighting the correct column before choosing the chart option, or by manipulating the input fields in the chart tool. As with the formula question, several students quit the pie chart task without trying to complete it.

Printing

One of the interesting findings from the PDF section of the study was the role that campus PC default settings play in students' ability to complete technology tasks. For the study, the authors at GCC and Penn State Altoona used internet explorer (IE), the campus default internet browser, to host the technology tasks, but the Penn State Shenango data collector used the Firefox browser. Variations in the browser settings made the "print PDF" task easy for students at GCC and Penn State Altoona, with 100 percent success for all participants at both campuses, while Penn State Shenango had only 47 percent success rate with the Firefox browser because the browser toolbar did not offer the same easy printing capability as IE. Students using IE were able to print the PDF using the browser's print option, but students using Firefox had to locate and use the Adobe toolbar associated with the PDF in order to print. Students face technology roadblocks like this throughout their college experience, and they need to learn to adapt to different software programs, different versions of the same program, and a variety of settings on computers at home and on-campus. From a campus technology perspective, it's vital to offer students multiple internet browser options, including IE, Firefox, Chrome, or others, because web programs often behave differently from browser to browser. While security is often the deciding factor in campus browser choice, usability should also be considered.

With the widespread use of Course Management Systems like Angel and Blackboard, it is easier than ever for students to retrieve and review class notes posted by faculty in Microsoft PowerPoint format. Many students choose to print these PowerPoint documents for reasons ranging from a preference for reading and

reviewing print rather than online documents to fear that the online copy will be pulled at some point in the semester. Because faculty-prepared presentations often default to print one slide per page, this can quickly eat up free-printing allotments for campuses that offer that benefit for students. The authors had often observed frequent inefficient printing and wasted paper in the library, and the results of this study confirmed their suspicion that students were unfamiliar with the ways in which they could modify their printouts in order to save paper. Only 19 students of 39, or 49 percent, were able to change the print settings in PowerPoint to print three slides to a page, and only 14 of 39, or percent successfully printed slides with notes.

As demonstrated by the effect of using different internet browsers on student ability to print PDFs, software versions can also help or hinder student technology performance. For the study, Penn State Altoona students used a 2007 version of PowerPoint, while GCC and Penn State Shenango used PowerPoint 2010.

In both versions, the inability to see all available print options was a deterrent to task success. Participants recognized that the functions for printing handouts and notes pages would be found by selecting the print menu option, but were then confused by the choices offered on the resulting interface. The 2007 software did show an option for handouts, but it remained grayed out until the student clicked on the "print what": dropdown arrow. Four of 15 Altoona participants spent considerable time trying to click on the "grayed out" area without successfully completing the task. For the PowerPoint 2010 print menu, students did not understand that handout and notes options would be located under the "Full Page Slides" dropdown area.

Windows/PC environment

Participants at GCC accessed the files associated with the technology tasks by clicking on links to them from the study LibGuide. All of these participants were able to access the files, and then navigate back to the LibGuide to complete the next section of the study. However, at the two Penn State campuses, the Techsmith Morae setup required the participants to leave the questionnaire in order to complete the assigned tasks in the appropriate software environment. The Penn State researchers placed the necessary documents on the desktop of the test PC, and directed the participants to find the documents at the location. The traditional aged students at Penn State Altoona did not have any trouble switching Windows to get to the desktop, and they were able to maneuver between several open Windows. However, several participants at Penn State Shenango campus, which has a higher population of non-traditional students, struggled to navigate in the PC environment. These participants often did not close Windows as they completed tasks, which prevented them from finding the necessary software files located on the desktop. When asked to locate the files on the desktop, some students were inventive, using the start button or the documents folder to navigate to the requested files, but they lacked the understanding that the desktop was underneath the open Windows. It is important for faculty and librarians to remember that not all students may understand how a Windows environment works, and they may be unfamiliar with terms like "desktop" and "closing windows." Library web pages and databases are often designed to activate multiple pop-up Windows, and some users may have trouble navigating in this environment until they are taught to do so.

E-mail and file management

In order to test participants' ability to manage files and deliver them via e-mail, the Word section of the study asked each participant to send a Word document as an

attachment via e-mail. In order to preserve the anonymity of the participants, and to save time that could have been lost by waiting for students to access their personal e-mail accounts, the authors created a dummy Gmail account for the study. The data collector logged into the account and left it open during the study and participants were shown its location so that they could use it to complete that task.

Faculty frequently ask students to send their assignments by e-mail as attachments, even in the early weeks of a semester. The authors had observed that although students could usually find their own e-mail account, they often could not understand the PC file storage structure and its relationship to USB drives and cloud storage, and were unable to identify where they had saved the file that they needed to attach to an e-mail. The study verified these anecdotal observations. In total 17 of the 39 participants, or 44 percent, were unable to attach the required file and send it as an attachment. Out of these 17, several students were able to send the e-mail, but they either copied and pasted the contents of the file into the body of the message, or sent the e-mail without the document in any form. In one telling e-mail that was sent by a participant from Penn State Shenango, the body read "I am sorry I can't find what I did with that download," even though the task immediately preceding the e-mail attachment task was to save the necessary document to the desktop.

The Gmail e-mail software was problematic for many of the participants, even though it is the e-mail software used for student mail at GCC, and it uses standard e-mail terminology and icons. Three students at Penn State Altoona were unable to identify the bright pink "Compose" button as the means to start an e-mail message, perhaps because they were unfamiliar with that terminology. Those who were unable to find "Compose," instead sought other methods to create an e-mail. One student clicked on "Contact" instead of "Compose," entered the e-mail address in the address book entry, located the envelope icon from the newly created toolbar, and successfully sent the e-mail and attachment. Many of the participants were not able to identify the icon of a paperclip as the symbol for attachment. The problems that the participants in this study had with e-mail are similar to those seen in Sveum's study, where freshman education majors "performed marginally on Electronic Mail," prompting Sveum to comment, "This result is somewhat surprising since Electronic Mail is a nearly universal communication application in school, work and home." (Sveum, 2010, p. 218) Anecdotal reference desk experience shows that students only use e-mail when they are forced to do so for a class. Texting has taken the place of e-mail when communicating with each other.

Study limitations

The process used to select participants was not a random sample. Instead, participants were self-selected, and the results are neither authoritative nor thorough. However, similar to Foster's, 2006 review of the ETS's study on information literacy, the findings do "offer some indication that students need more training in information literacy" (Foster, 2006, p. A36).

The performance-based assessment tool designed by the researchers was not vetted by any outside parties, and may not be as accurate as the for-profit computer literacy tests like iSkills or SAM. Every effort was made to create a valid instrument, but there may have been unforeseen and unintended errors or omissions. The assessment tool was administered and the data were collected using different software at the Penn State campuses and at GCC, but the recordings were analyzed in the same way, the proficiency grading was based on the same criteria, and the data themselves were very

similar across all three campuses, regardless of collection method. Because the focus of the study was on academic software proficiency, the manner in which the questions were asked and participant actions were recorded did not affect the results.

The tool designed by the researchers was PC-based, which could have been problematic for participants more familiar with a Mac environment. However, review of the screen capture recordings did not show any obvious difficulty with navigation of the PC environment, and Windows is the standard campus computer environment at all three campuses.

Conclusions

This study confirms the findings of the 2014 ECAR student technology study and those of previous studies of student technology skills: students may be familiar with academic technology, but as a whole they are not experts, and many students have significant gaps in their skills that can affect their ability to succeed in their courses. College faculty should be aware that students may not be as proficient with commonly used academic technology as the faculty expect them to be, and the students may not realize how little they know until they are a faced with a challenging technology-based assignment. Students often need more help than they are willing to admit, and colleges need to catch these students at their point of need, whenever possible. Because student needs are individualistic and can appear at different times throughout the semester, it is best to provide on-demand help for students in multiple locations and formats. One option for faculty to consider is placing URLs or active links to online technology tutorials (YouTube, Lynda.com) near assignment descriptions on their syllabi or within a course management system.

To address student technology needs, the 2014 ECAR student technology study recommends that colleges "have clear and accessible service-level options for students who look to the college and university for tech support," and "champion the paradigm shift to the DIY (Do It Yourself) support (e.g. using Google or YouTube and asking friends or family) that accompanies the bring-your-own-everything culture, but be prepared to refer students in finding and using this support" (Dahlstrom and Bichsel, 2014, p. 35). Librarians are uniquely positioned to support and carry out both of these recommendations. Students may be more likely to ask for help outside of the classroom, as seen by current levels of technology-related questions at the reference desks included in this study. To try to meet these needs, some libraries have been able to bring campus tech support staff into the library, often as part of information commons projects. It is the hope of the researchers that data from studies like this will help convince campus administration that additional student technology support is needed across campus, both in the library and in other computer labs.

Along with providing additional tech support personnel, many librarians also have access to technology like TechSmith's Camtasia software, which can be used to create short, just-in-time tutorials to support-specific student technology needs. These tutorials can be saved on college servers or in YouTube, and can be embedded on library web pages or in course management systems to be used as class resources. For example, to help students set up APA and Chicago style papers, the GCC library created a screen capture tutorial on how to insert a running head in Word 2010. That video, which runs for 54 seconds, has been viewed over 11,000 times since it was created in 2012, and its view count is more than double that of the second most popular tutorial.

One of the most interesting observations of this study was that none of the participants used the help feature in Microsoft Office, even when they clearly needed help. It is possible

that they did not think that they were allowed to look for help, but it is more likely that they were not used to using the help icon, or that using Google or YouTube to look for technology answers did not occur to them. The goal of most college librarians is to train students to become better researchers, which includes teaching them to find technology answers for themselves, at any time, when a librarian or computer tech assistant might not be available. Librarians need to help students learn to help themselves and to identify ways to find the answers to their difficult technology questions.

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Appendix 1. Task checklist

Task checklist

(1) PDFs:

- open and print the PDF;
- save it to the computer; and
- e-mail it using gmail to bbi1@psu.edu

(2) Word:

- open the file and write two to three sentences about your hometown;
- put the name of your hometown in a footnote;
- put "My Header" in the header; and

- add the name of your hometown and the year of your birth to the filename and save the file to the computer.

(3) Powerpoint:

- open the file and view it as a slideshow;
- print three slides to a page; and
- print the slide with notes.

(4) Excel:

- open the file and create a pie chart from the data in the first six rows; and
- insert a formula to add the numbers under Student Color Choice and put the total in row eight to the right of the "Total" cell.

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