Academic technology confidence levels vs ability in first-year traditional and non-traditional undergraduates

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Abstract

Purpose – The purpose of this paper is to examine the technology confidence, skills, and post-skills-test emotions in traditional (younger than 24 years old) and non-traditional (24 and older) first-year college students at three undergraduate campuses in the Northeastern USA.

Design/methodology/approach – Totally, 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 – The majority of the students struggled with at least one facet of academic software. Traditional students were more confident than non-traditional students in their technology skills, but they did not score any higher on the skills test. Students who placed at the high end and low end of the test results curve most accurately assessed their technology skills, and their post-test feelings were the most appropriate in light of their test results. A large percentage of the traditional aged students were overconfident about their skills and self-identified as "happy" or "wonderful" even after performing poorly on the test.

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. In addition, there have been no studies that examine student immediate emotional response to test performance in this type of testing environment.

Keywords Academic libraries, Technology, Students, Computer software, Reference services, Software tools

Paper type Research paper

Over the past several decades, as libraries have increased their number of student workstations, many academic libraries have expanded their services to offer help with the academic software (Microsoft Office, e-mail software, and course-specific software) accessible from these machines. One of the challenges that librarians face in helping students with this software is that the students often do not realize that they need technical help until just before their assignment is due, at which point it might be too late to locate an IT professional. After dealing with last-minute questions for several years at the Reference Desk, librarians at three undergraduate academic institutions in the northeast designed a study to assess the technology skills of incoming first-year college students, identify the technology confidence levels of these students, and determine whether or not their technology abilities, or lack thereof, were of concern to the students.

Library Hi Tech
Vol. 34 No. 3, 2016
pp. 468-479

0737-8831
DOI 10.1108/LHT-03-2016-0032

The authors focussed their research on incoming freshmen because there is often an assumption by both faculty and librarians that students come to college with the technology skills needed to succeed in their classes (Olsen, 2000; Grant *et al.*, 2009). Most faculty members do not have time to teach students technology skills in addition to the subject content already covered in their courses, so this instruction is often left to the students' peers, librarians, and campus computer lab support staff. Because of the pervasive concept of the "digital native," described by Marc Prensky in 2001 as the ways in which students born in the digital age are more adept at using technology than digital non-natives, the authors were especially interested in learning if the age of the incoming freshman made a difference in their technology abilities, confidence levels, and concern about their skills.

If, as the authors suspected, first-year students do not have the skills necessary to complete their assignments, campus personnel need to find ways to better support these students and help them gain the required technology expertise. Librarians are ideally placed to try to help students succeed with technology at their point of need, and could further help students by offering one-shot instruction on a particular technology topic, by working with campus IT to create technology tutorials, or by finding other innovative ways to reach out to students. Student technology confidence levels, and concern, or lack thereof, about their skills, will strongly affect whether or not a student takes advantage of any of these means of assistance. Librarians and other campus personnel need more information about how well students interact with academic technology in order to design and implement the best tools for helping students succeed in their technology-based assignments.

Literature review

Digital natives

In 2001, Prensky coined the term "digital natives" (also referred to as the Net Generation or Millenials) and claimed that students born after 1980 were naturally more adept than older generations at using technology because they had been surrounded by it throughout their lives (Prensky, 2001; Kennedy *et al.*, 2008; Gross and Latham, 2012). This concept was quickly adopted in academia because it made sense to assume that people who grew up surrounded by technology would be more comfortable with it and better at using it than those who were unfamiliar with it. However, many studies have been published in the past decade that challenge this idea of the native technology expert. Jones *et al.* (2010), notes that even Prensky has started to distance himself from the idea of the digital native. Nonetheless, the idea remains persistent in academia, and anecdotal evidence shows that faculty and librarians expect incoming freshman to be comfortable and familiar with academic technology tools like e-mail, Microsoft Word, using PDFs, etc., regardless of the students' age, class, and educational background.

Technology confidence and correlation with skills

Many students are overconfident about their computer skills, which can lead to problems when faculty expectation of student skills outpace the reality of those skills. Ballantine *et al.* (2007) noted that both experienced and inexperienced users of computers had a tendency to overestimate their computing competency. Grant *et al.*'s (2009) study of 173 introductory business course students found that the students were overconfident about their Microsoft Word and Excel skills, but they underestimated their abilities in PowerPoint. Wilkinson (2010, p. 117) explained that "students are not

as proficient with computer skills as they perceive [themselves] to be" and "students typically have more to learn about computer literacy upon entering college than they believe." Gross and Latham (2012) found that underachieving students believed both before and after the test that they would score above average. This overconfidence can be a problem for students because it can make them discouraged when they do not have the skills that they think they have (Grant *et al.*, 2009), and it can prevent them from taking advantage of computer skills training opportunities on campus. Grant *et al.* (2009, p. 156) notes that "educators must address low skill performance at the time that it occurs," meaning that problems need to be caught at the point of failure, because if training happens too early or too late, the students might not be receptive.

Age differences

Studies have shown that student age differences can affect their technology confidence levels but have less of an effect on their actual skills. Jones *et al.*'s (2010) results showed that traditional aged students of 25 and younger were more confident than older students in all information and communications technology tasks. Dickerson (2005) also found that younger students were more confident than older students in their Microsoft PowerPoint and Excel skills, but older and younger students were equally confident in using Word. However, unlike Jones *et al.* and Dickerson, the 2014 EDUCAUSE Center for Analysis and Research (ECAR) Study of Students and Information Technology's finding demonstrated that age did not affect a student's inclination toward technology (Dahlstrom and Bichsel, 2014). Although he saw differences in technology confidence levels between older and younger sets of students, Dickerson (2005) found no difference in the test result mean for PowerPoint, Excel, and Word. Both Waycott *et al.* (2010) and Guo *et al.*'s (2008) studies found similar technology test results, noting that "there was no statistically significant difference in ICT scores between digital natives [aged 20 to 24] and digital immigrants [aged 25 +]" (Guo *et al.*, 2008, p. 251).

Technology and emotions

In her study examining emotions felt by education students when learning new software, Kay (2007) noted that only anxiety has been studied extensively in connection with computers. Her results showed a wider range of emotions than simple anxiety: "happiness (curiosity, satisfaction, excitement)" was experienced frequently, while "negative emotions (anxiety, anger, and sadness)" were experienced less frequently (Kay, 2007, p. 457). Van Braak (2004) pointed out that "personal, subjective feelings and beliefs towards computers" can have a stronger impact on computer competence than actual computer experience (van Braak, 2004, p. 310), demonstrating that emotions can affect a student's belief in their own skills, and the reality of those skills. There are no examples in the literature of studies that examined whether or not students showed concern about their skills after completing a technology skills test. This part of the authors' study is a unique contribution to the literature.

Method

Participants and procedures

The participants in the study were first-year college students from three different undergraduate college campuses in the Northeast, recruited and studied during the first four weeks of the Fall 2013 semester. All three campuses involved in the study serve a percentage of non-traditional students, defined by the campus administration at all three

campuses as students aged 24 and older. Genesee Community College (GCC), an open admission two-year community college in Batavia, New York, had a Fall 2013 student population composed of 22 percent non-traditional students. Penn State Altoona and Penn State Shenango are both four-year campuses in the Penn State University System, but they have very different characteristics. For the Fall of 2013, Penn State Altoona's student population was predominantly traditional aged students (89 percent), while Penn State Shenango's student population was only 40 percent traditional aged students. All three campuses had FTE numbers ranging from 2,200 to 4,000 for the Fall 2013 semester.

Librarians at the three campuses publicized the study both at tables in the library and as announcements in classes. Participation in the study was voluntary, and the researchers capped the number of participants at 40 in order to keep data capture and analysis manageable. All of the participants received a $10 gift card for their participation. Study participants were screened to make sure that they were first-year students. In order to determine the age of the student for comparison of traditional aged vs non-traditional students, each student was required to enter their birthdate during the testing session. That data showed the following participant demographics (Table I). One of the students recruited at GCC was found to be a second year student upon completion of the study session, and that student's data was excluded from the study findings.

The study data were collected during September 2013 using an electronic questionnaire/test and screen capture technology to record the participants' computer screen and mouse movements. The research session took place in a room equipped with a computer with the necessary software, and the researcher waited outside of the door in order to answer any participant questions.

GCC's Institutional Research Office consented to the study, and the project was approved by Penn State University's Institutional Review Board. Participants received an implied consent form prior to the research session, were allowed to remove themselves from the study at any time, and were given the opportunity to ask questions about the study and the recording methods.

Measures

Technology competence

The authors designed the skills test to cover the four software packages that were most frequently asked about by students at the campuses' Reference Desks: PDFs, Microsoft Office Word, PowerPoint, and Excel. The participants were asked to complete two to four tasks using each software (Appendix). The authors created questions that would not only test the participants' abilities to use those specific software packages, but also their skills with file management and e-mail. For each type of software, participants were asked to open pre-existing files created by the researchers, and for the e-mail section they were directed to a webpage with a logged-in Gmail account created specifically for the study. Screen capture technology was used to capture the participants' interaction with the software, how long it took each participant to complete each task, and whether or not he or she attempted to complete each section.

	Traditional aged (18-23)	Non-traditional aged (24+)
GCC	9	1
Penn State Altoona	15	0
Penn State Shenango	0	15

Table I.
Participant age demographic

Pre-task confidence

Within each software package section, the participant was asked to rate his or her pre-test confidence level on a 1-5 bipolar scale with 1 as Poor and 5 as Expert.

Post-test feelings

After each software package section, the participants were asked to rate their feelings on a 1-to-5 bipolar scale using both emoticons and text, covering the following range of emotions: "annoyed," "sad," "meh," "happy," or "wonderful." The authors employed emoticons in this section of the study because students are used to seeing and using these symbols to describe their emotional state in social media programs such as Facebook.

Results and discussion

Pre-test confidence

All 30 of the students at Penn State Altoona and Penn State Shenango completed this section of the study for all four software areas. Eight of nine participants at GCC completed all four sections, but one student completed only the first question about PDFs confidence (Table II).

Students were most confident in their abilities to use Word. Totally, 74 percent of 38 respondents identified themselves as 4 or 5 on the scale, with 5 being "expert." PowerPoint confidence ratings were also high, with 55 percent of the 38 respondents identifying as 4 or 5. For the PDFs section, participants most heavily identified as 3 or 4, with 35.90 percent and 30.77 percent of 39 respondents, respectively. Students were least confident in their Excel skills, with ~55 percent self-identifying their skills as 1 (Poor) or 2.

Overall, non-traditional students at Penn State Shenango self-identified their software confidence skills as "Poor" more often than GCC and Penn State Altoona. Three students marked themselves as "Poor" for the PDF section, one marked themselves as "Poor" for the Word section, five for the PowerPoint section, and six for the Excel section. In contrast, none of the students from Penn State Altoona (all traditional aged) marked themselves as "Poor" for any of the sections.

	Poor (1)	2	3	4	Expert (5)
Task 1 – PDFs					
GCC		1	5	3	
Penn State Altoona		2	8	4	1
Penn State Shenango	3	6	1	5	
Task 2 – Word					
GCC		1	1	4	2
Penn State Altoona			2	7	6
Penn State Shenango	1	3	2	8	1
Task 3 – PowerPoint					
GCC		1	1	6	
Penn State Altoona			2	7	6
Penn State Shenango	5	5	3	1	1
Task 4 – Excel					
GCC	1	5	2		
Penn State Altoona		6	6	3	
Penn State Shenango	6	3	3	3	

Table II.
Student pre-test confidence levels

One traditional student from GCC marked themselves as "Poor" for the Excel section, but there were no other "Poor" selections for any of the other tasks.

On the other end of the spectrum, Penn State Altoona had the highest number of students who marked themselves as experts in a particular software. Six students marked themselves as "Expert" for Word, six for PowerPoint, and one for PDFs. At GCC, two students marked themselves as "Expert" for Word but no one self-identified as an expert for any of the other sections. At Penn State Shenango, one student self-identified as "Expert" at Word and one at PowerPoint. None of the participants at any campus marked themselves as experts for Excel.

At GCC, five of the nine participants, or more than half, rated themselves as 4 or 5 in two or more categories. All five of them, all traditional students, rated themselves highly in Word and PowerPoint, and two of the five rated themselves positively in using PDFs as well. Two of the nine participants rated themselves as 1 or 2 in two or more categories, including this campus's only non-traditional participant, in Word, PowerPoint and Excel.

The Morae screen capture software used at Penn State Altoona and Penn State Shenango included recording time marker features that let the authors easily compare time taken for tasks at the two campuses. The traditional students at Penn State Altoona completed the pre-test confidence surveys quickly, in a very direct manner, with little time for reflection. Penn State Altoona's shortest time taken to complete a survey was 7.4 seconds, its longest time taken was 36.2 seconds, and its average was 20.4 seconds. The non-traditional students at Penn State Shenango took longer to complete the confidence surveys, perhaps because they were considering the questions more thoroughly than the traditional students. Penn State Shenango's shortest time taken to complete a survey was ten seconds, its longest time taken was 50 seconds, and its average was 25.2 seconds.

Software competence

All 39 qualified participants attempted to complete at least one question in each section, and the success rate for the participants is shown in Table III.

Penn State Shenango's group of non-traditional students had a higher proportion of participants who failed to complete all of the tasks in a software section than GCC and Penn State Altoona. Three students at Penn State Shenango failed to successfully complete any of the PDF tasks, two failed to complete any of the Word tasks, and four failed to complete any of the PowerPoint tasks. GCC had one student who failed to complete all of the PowerPoint tasks but all students completed at least one of the PDF and Word tasks. Penn State Altoona had one student who failed to complete all of the Word tasks, but all other students completed at least one of the PDF and PowerPoint tasks. All three schools had a significant number of participants who failed to successfully complete either or both of the Excel tasks. Six out of nine, or 67 percent of GCC's participants completely failed the Excel section, nine of 15 or 60 percent of Penn State Altoona's participants failed either or both tasks, and 11 of 15 or 73 percent of Penn State Shenango's participants failed to complete any of the Excel tasks.

Successful completion rates varied between the campuses. Totally, 78 percent of students at GCC and 73 percent of students at Penn State Altoona successfully completed all of the PDF tasks, compared to 33 percent at Penn State Shenango. For the Word tasks, 78 percent of students at GCC either got three of four correct, or all four questions correct, and 53 percent of Penn State Shenango's students did the same, compared to 33 percent of Penn State Altoona students who got either three of four correct or all four correct. PowerPoint success rates at Penn State Altoona and Penn State Shenango were similar,

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	4	5	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		

Table III.
Software competence success rates

with 33 percent of Penn State Altoona's students getting all three questions correct, and 27 percent of Penn State Shenango's students doing the same. Only 11 percent, or one out of nine, of GCC's students got all three PowerPoint questions correct. The students at Penn State Altoona were the most successful at the Excel questions, with 40 percent getting both questions correct, compared to 22 percent at GCC and 20 percent at Penn State Shenango.

As noted above, the non-traditional students at Penn State Shenango had more complete failures in the Word, PDF, and PowerPoint sections than the traditional age groups at GCC and Penn State Altoona, but their success rates were on par with those of the traditional age groups, which mirrors Dickerson (2005) and Guo *et al.*'s (2008) study results. Penn State Shenango's non-traditional students included those who got all questions correct in all four categories, their success statistics for Word questions were better than the those of the traditional students at Penn State Altoona, and their PowerPoint success statistics were better than those of the traditional students at GCC. The non-traditional student at GCC was not as successful as the other participants at GCC, having fewer correct actions across the board, but that student successfully completed at least one task in PDFs, Word, and PowerPoint.

Post-test feelings

Not all of the participants completed the post-test feelings section of the study. Of the 39 participants, 33 completed the PDFs post-test feelings question, 33 completed the Word question, 32 completed the PowerPoint question, and 32 completed the Excel question (Table IV).

Study participants self-identified predominantly as "happy" or "wonderful" after completing PDF and Word tasks, with 76 percent of total respondents marking one of those two options for PDFs and 82 percent doing the same for Word. Responses were more mixed for the PowerPoint section, with 50 percent of respondents marking "happy" or "wonderful" and 44 percent marking "meh." Participants were least positive

	Annoyed	Sad	Meh	Happy	Wonderful
Task 1 – PDFs					
GCC	1			4	2
Penn State Altoona		1	1	7	6
Penn State Shenango	2		3	5	1
Task 2 – Word					
GCC				6	1
Penn State Altoona			4	6	5
Penn State Shenango		2		7	2
Task 3 – PowerPoint					
GCC			4	1	1
Penn State Altoona	1		5	5	4
Penn State Shenango		1	5	4	1
Task 4 – Excel					
GCC		4	2	1	1
Penn State Altoona	1	3	5	4	2
Penn State Shenango	4	1		4	

Table IV.
Post-test feelings

after completing the section on Excel, but the results were split, with 41 percent marking "annoyed" or "sad," 38 percent marking "happy" or "wonderful," and 22 percent marking "meh."

Students from Penn State Altoona, all of whom were traditional aged students, self-identified their post-test feelings the most positively out of the three campuses. Six participants marked their feelings as wonderful following the PDF section, five did the same following the Word section, and four did the same following the PowerPoint section.

Correlation between pre-test confidence, software competence, and post-test feelings

How accurately did the participants in the study rate their actual software competence? As a whole, the participants did better at the PDF tasks than they expected to, but it is possible that they were unable to rate their PDF competence because they were unclear as to what a PDF test would entail. Only one student claimed to be a PDF expert, but 34 out of 39 participants successfully completed two out of three or all of the PDF tasks. The participants were overconfident about their Word skills, particularly the traditional students at Penn State Altoona, with 28 of 38 respondents claiming to be 4 or 5 (expert) on the confidence scale, but only 20 of 39 participants successfully completed either three out of four or all of the Word tasks.

On the whole, the participants accurately judged their PowerPoint and Excel skills. In total, 21 of 38 respondents claimed to be a 4 or 5 on the confidence scale for the PowerPoint section, and 20 of 39 participants were successful at all or two of three of the tasks. Totally, 21 of 39 respondents claimed to have poor Excel skills, marking either 1 (poor) or 2 on the confidence scale, and 22 of 39 students failed to complete either of the two Excel tasks.

At an individual level, how well did the participants identify their own skills? Three of the four most successful traditional students at GCC and Penn State Altoona were appropriately confident in their own skills. They all selected 4 or 5 (Expert) in the pre-test survey for PDFs, Word, and PowerPoint, and went on to successfully complete all of the tasks in those sections, except for one student who missed one question in

the PowerPoint section. They were more cautious about the Excel section, marking themselves as two 3s and a 4 in the confidence survey, but two out of three were able to complete the two Excel tasks accurately. One of the students was unable to complete one of the Excel questions. For each section that they completed accurately, each student marked "happy" or "wonderful" in the post-test feelings survey. Interestingly, the student who missed the question in the PowerPoint section marked "meh" for the post-testing feelings question for that section, and the student who missed one question in the Excel section marked "sad" in the post-test feelings question.

The fourth traditional student who successfully completed all of the tasks in each section put more consideration into the confidence ranking, changing his or her response from a 2 to a 3 in PDFs, changing a 3 rating to a 4 for Word, a 4 for PowerPoint, and a 2 for Excel. This student successfully completed all ten technology tasks in a minimal amount of time and indicated "happy" and "wonderful" feelings upon task completion.

The two non-traditional students with the greatest success at completing the technology tasks did not rank their confidence level extremely high as they started the study. Student 1 ranked him/herself as a 4 in PDF, Word, and Excel, and a 3 in PowerPoint. Student 2 self-selected a 1 (Poor) in Excel, 2 in PDF, 3 in PowerPoint, and a 4 in Word. Both participants successfully completed all tasks, but at times had to explore multiple routes before finding the correct solution. Their post-test feelings included many "wonderfuls" and "happys," but also an "annoyed" and "meh" when they struggled.

The two traditional aged participants with the poorest overall performance, both from Penn State Altoona, ranked their confidence level fairly high on the 1-5 scale. For PDFs, Student 1 selected 2 and Student 2 selected 3. For Word and PowerPoint, both self-selected a 4 rating, and for Excel a 3. While both participants failed the majority of tasks, their post-task feelings did not reflect the struggle witnessed by data collectors, nor the fact that in several instances the individual quit without completing the task. In both cases, the participants indicated their feelings as "happy" and "meh" for each task section, even though they had done poorly. They were not alone in exhibiting a disregard for their poor performance. The students at Penn State Altoona were generally overconfident in their abilities and showed positive emotional responses, whether or not they were able to complete the computer tasks. It is possible that they were happy because they knew that they would receive a gift card whether or not they did well on the tasks, or, more problematically, their lack of concern reflects their overabundance of self-confidence and strong sense of self, which can lead to academic failure when they realize too late that they need more help than they thought they did.

The three non-traditional students with the greatest failure rate for the technology tasks, from GCC and Penn State Shenango, were aware that their software skills were not the best, and their confidence ratings, success rate, and post-test feelings correlated accurately. Their confidence ratings for PDFs were two 1s and a 2, they selected two 1s and a 3 for Word and Excel, and all three chose 1 for PowerPoint. All three participants struggled and were unable to complete the majority of tasks. The three students did not complete the majority of the post-test feelings surveys, in part because the Penn State Shenango participants struggled to find the emoticons stored on the test PC's desktop. Two of the three students selected the "sad" emoticon when they did find and complete the post-test feelings survey.

Limitations

The participants for this study were self-selected, and were not a random sample of the population at any of the campuses. Therefore, the study results are not authoritative,

but they do provide a qualitative look at the technology skills, confidence levels, and post-technology-test feelings of incoming college freshmen.

The assessment tool designed by the researchers has not been reviewed by any outside parties, and there may have been unintended errors in the design. The pre-test confidence and post-test feelings surveys were also not reviewed, and the self-report nature of the questionnaire could be a limitation.

Age was the only demographic gathered by the authors, but it is not the only factor that can affect a student's technology confidence, success rate, and feelings. There are many factors that can affect a student's technology skills and confidence levels, including educational background, class, and advantage (Brown and Czerniewicz, 2010; Goode, 2010; Helsper and Eynon, 2010). Kennedy *et al.* (2010) notes that gender, university, and cultural background can also affect a student's technology experience, and van Braak (2004) found that gender made a difference in a student's confidence rating, but it did not make a difference in "the actual degree of computer competence." The author's focus on age alone may have missed other factors that affect the research results.

Conclusions and implications

The authors' experiences at the library Reference Desk were borne out by this study. The majority of the freshmen who participated in this preliminary qualitative review struggled with some aspect of academic technology, and a more thorough study based on a larger sample could confirm these findings. The researchers believe that students do not come to college knowing everything that they need to know in order to be successful. Traditional aged students were more confident in their abilities with technology than older students, but test results showed that their skills were similar. The data shows that the traditional aged students were more confident in their abilities than might be warranted. Even a few years difference in age made the adult students at Penn State Shenango more aware of their technology shortcomings than the traditional aged students at GCC and Penn State Altoona.

Students at the top end and the bottom end of the range for task success were more realistic about their abilities than those in the middle. Successful students were generally confident about their skills, and in the two cases where they were unable to answer a task question, their post-test feelings rating of "meh" and "sad" showed that it bothered them. Low end students knew that they did not have good technology skills, and their low confidence ratings correlated with their low test performance success. These students were unhappy about their poor skills, and marked the post-feelings survey as "sad" to reflect this disappointment. Students at both ends of the spectrum might be willing to attend one-shot instruction sessions about technology because they have accurate sense of their skills, and they are disappointed when they are unable to answer questions.

The middle group of students is the most problematic for librarians to reach with instruction tools. These students, predominantly traditional aged students, are overconfident and are unconcerned by their lack of skills. These are the students who often realize too late that they do not have the skills needed to complete an assignment, and they often realize this in the last minutes before a paper is due. More work needs to be done to find ways to reach these students, in a way that best fits their needs.

Librarians are in a unique position to witness the amount of time and effort wasted by students when they do not have the technology skills to complete an assignment, and should convey this information to the teaching faculty member. Campuses need to offer basic technology assistance to incoming students and provide helpdesk services, both in-person and by phone. Faculty members should include links to online tutorials

and/or phone numbers for technology helpdesks within the text of their assignments that require even the most basic technological components. As this research has proven, few students will self-identify as requiring technology assistance until they are at the point of need.

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Appendix. Task checklist

1. PDFs:

- o Open and print the PDF
- o Save it to the computer
- o Email it using Gmail to the following email address _____

2. Word:

- o Open the file and write 2-3 sentences about your hometown
- o Put the name of your hometown in a footnote
- o Put "My Header" in the header
- o Add the name of your hometown and the year of your birth to the filename and save the file to the computer

3. Powerpoint:

- o Open the file and view it as a slideshow
- o Print 3 slides to a page
- o Print the slide with notes

4. Excel:

- o Open the file and create a pie chart from the data in the first six rows
- o Insert a formula to add the numbers under Student Color Choice and put the total in row 8 to the right of the "Total" cell

About the authors

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