College Students' Computer Self-Efficacy, Preferences, and Benefits: A 10-Year Comparison

Suzanne R. Clayton
Associate Professor of Practice in Information Systems
College of Business & Public Administration
Drake University
Des Moines, Iowa

Joyce Njoroge
Associate Professor of Accounting
College of Business & Public Administration
Drake University
Des Moines, Iowa

Diana Reed
Associate Professor of Management and International Business
College of Business & Public Administration
Drake University
Des Moines, Iowa

Inchul Suh
Associate Professor of Finance
College of Business & Public Administration
Drake University
Des Moines, Iowa

ABSTRACT

As universities struggle with resource allocation, our study helps shed light onto what students' perceive as benefits of technology in their learning process. We had the exciting opportunity to compare data collected of undergraduate business students in a small Midwestern university college of business from 2004 to data we collected using a very similar instrument administered in 2014 (in our review we could not find other comparison studies of this nature). The changes in these students' self-efficacy, preferences, and benefits of technology over a ten-year period were very surprising given our current concept of students as "digital natives". We find students have lower computer self-efficacy (CSE) today than students from ten years ago. In addition, our study shows that, while both current and former students consider technology beneficial to their learning process, their preferences have shifted. This study only scratches the surface and seeks first to look at the contradictory and confusing comparison results, the "why" will be addressed in further study.

Keywords: Computer self-efficacy, educational technology, benefits of technology, longitudinal comparison of technology use

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INTRODUCTION

The concerns in today's technology arena often focus on big data, data privacy, social media, and the benefits or detriments that today's technology has on students. Technology advancements continue to emerge on a near constant basis and their usage in higher education has become a critical part of students' learning. New technologies such as social media that were in their infancy 10 years ago are widely used and accepted not just in social/

personal settings but in professional settings and in higher education as well. We would therefore expect the typical student entering college now to be different from the typical student in the past due to their exposure to the new and different technologies available today. It is very seldom that researchers are provided with an opportunity to go back in time and compare a data set collected 10 years ago to a replication of that data collected recently. This is exactly the situation that presented itself and we were given a unique chance to re-administer a survey in 2014 that was originally conducted in 2004 (survey instruments and raw data results available upon request), to provide a 10-year comparison of students' self-efficacy, preferences and benefits of technology in a Midwestern private University's College of Business. No additional studies of this nature have been found in our review.

The results of this research are an important step in an attempt to try to understand changes in students' views toward technology use in a business classroom. The possible impact on how we go forward in technology use with regard to both content and pedagogy is just one of the reasons that the study results may be important. Some of the long-held beliefs of many who are presumed to understand the mind of the digital native, by definition and presumption all entering college students of this era (Renes and Strange, 2011), may come into question. There have been some who have been making very quiet noise, dismissed as anecdotal, about college students being more adept at creating a great "selfie" than doing any type of analysis requiring the intersection of rows and columns. We confirm that the digital natives, of which many researchers speak, have lower computer self-efficacy than students from ten years ago. This could cause some to be concerned about how prepared these students might be to work in today's businesses. The concept of the arrival of the digital native may not be as pervasive and as constant in today's classrooms as we have previously thought.

BACKGROUND AND REVIEW OF LITERATURE

University educators have known for a long time that technology is an essential element in teaching and that technological devices are commonplace across college campuses. It has been stated by Renes and Strange (p. 203) that "technology has forever changed the face of higher education." This statement is further supported by several others (Appana, 2008; Dykman and Davis, 2008; Ellis et al.,2009; Owens et al., 2009; Ozdemir and Abrevaya, 2007; Salinas, 2008; Zhao et al., 2009). Universities have made generous investments in educational technology in recent years supported by the premise that technology can help students learn more efficiently and effectively resulting in an increase in academic achievement (Lei, 2010). This investment, at least for the last two decades, has seen a tremendous growth in the use of technology in university classrooms.

Technology is widely used and expected by all students and instructors at the university level. It is believed that the current generation of students, referred to as technology/digital natives due to their presumed technology usage, is quite sophisticated when it comes to use of technology in their lives (Margaryan et al., 2011). To these students, technology is an important part of their learning and they expect it from their professors and institutions. Students' use and satisfaction with technology in all aspects of their lives, such as social media, would indicate a preference and an expectation of technology in higher education. To these digital natives, use of technology is a natural extension of themselves and an obvious choice for higher education (Renes and Strange, 2011). It is, therefore, important to understand the impact of students' self-efficacy toward various technological tools to better assist their learning process.

The concept of self-efficacy is based on the social cognitive theory and it is defined as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" according to Bandura (1977 & 1994). Self-efficacy is believed to play a significant role in how individuals engage their tasks and overcome any challenges. Studies have shown that high computer self-efficacy (CSE) is linked to better performances when dealing with computers (Cocorada, 2014), it is associated with lower levels of anxiety during technology training (Downey and Kher, 2015) and it leads to high perceived usefulness toward online learning environment and students' satisfaction (Cigdem, 2015). In addition to experience and satisfaction with technology, research has shown that students have positive attitudes towards technology (Eastman et al., 2011), they have strong positive perceptions about technology usage (Dahlstrom, 2012), and attitude towards technology is a factor in learner satisfaction (Arbaugh and Duray, 2002). Students also believe that technology benefits them and helps them achieve their academic goals (Dahlstrom, 2012). Hence, it is critical to study the changes in CSE over time to understand which technological tools are more important than others in assisting students in their learning process.

There is, however, some evidence that relying on contemporary technologies does not guarantee a better learning experience in the classroom (Kulesza, et al., 2010). Skolnik and Puzo (2008) found that technology (as represented by laptops) may increase academic dishonesty and may cause students to lose focus on class topics. Fried (2008) and Houle, et al. (2013) found that students using laptops frequently engaged in multitasking and as a result,

student learning was negatively affected. She also found that the use of laptops was distracting to other students. Cellphones have also been shown to create negative situations in college classrooms due to ringing during class and acting as a possible way to cheat during class exams (Campbell, 2006). It can be concluded from this that, overall, the research on technology in the classroom is inconclusive despite the importance that it plays in the lives of college students (Baker et al., 2012).

This lack of consensus in the research on the positive and negative aspects of technology in the college classroom may be due to how technology is viewed by today's students. It is assumed that these digital natives believe that all learning should be replete with technology (Garcia, 2007). The empirical research that has begun to emerge, however, in recent years on digital natives has started to indicate that they may possess a diverse range of technology skills and preferences (Kennedy et al., 2010) rather than be assumed as a homogenous group.

To help examine this concept, our study looks at students 10 years ago and students today. Have their perceived preferences concerning technology changed or are they holding steady? Are they more or less confident in technology and in what areas? Do they perceive themselves as more proficient in classroom technology? Have what they perceive as benefits of technology changed? It is important to answer these questions before proceeding with any drastic educational changes and who better to ask than the students themselves?

RESEARCH DESIGN

Data for this study was collected by use of a questionnaire given to Business college students at a Midwestern private university. The comprehensive questionnaire was designed to gather data from respondents regarding various technology issues. The first set of questions sought to determine respondents' computer self-efficacy (CSE) and experience with various technology products. The second set of questions was designed to assess the respondents' technology preferences. Questions in this section not only dealt with respondents' preference of general technology products' usage in and out of classrooms but also their preference of technology usage as an instructional tool. The third set of questions evaluated the extent to which different forms of technology are used inside classrooms and in out-of-class activities. The final part of the questionnaire asked respondents to assess the perceived benefits of various forms of technologies used in the classroom. In this section, participants responded to questions on what they perceive to be the benefit of various forms of technology including usage of videos, PowerPoint, Search Engines, and Course Websites. Respondents indicated whether those technologies enhanced their learning ability, their interest in the course, and their interaction with instructors and other students. The questionnaire used a five point Likert scale. Since the purpose of this study is to compare changes in the perceived proficiency, preferences, and benefits of technology over a ten-year period, data was collected once during the 2004 academic year and ten years later during the 2014 academic year. Distribution of surveys is shown in Table 1.

Table 1
Sample Data

Student Classification	2004		2014	
First-Year	297	48.7%	159	31.2%
Sophomore	47	7.7%	99	19.4%
Junior	141	23.1%	158	31.0%
Senior	123	20.2%	94	18.4%
N/A	2	0.3%	0	0.0%
Total	610	100.0%	510	100.0%

RESEARCH FINDINGS

Over the ten-year time frame, there were some notable similarities and differences in how students perceived technology use in the classroom, what preferences they had, how it was used by the faculty member towards them, and how they perceived benefits in supporting their learning process. We have honed in on the most important of these similarities and differences for brevity in this analysis.

Students' Computer Self-Efficacy

As shown in Table 2, students' CSE ratings toward nine commonly used technology items show interesting results. In both time periods, students rate themselves highly on using e-mails, web-based search engines, the Internet and word processing software; over 90% of them responded with either 4 (agree) or 5 (strongly agree) to the proficiency statement. They are also somewhat comfortable with presentation and spreadsheet software. However, less than 30% of them marked themselves either 4 (agree) or 5 (strongly agree) to the CSE statement for the database software, indicating that they do not perceive themselves as proficient in using databases. Survey results by students' year of study are consistent with the main findings, but, due to the extensiveness of results by class, they were excluded from this paper.

More interestingly, the mean values for seven out of nine technology items declined from the academic year (AY)

Table 2
Students' Self-Reported Proficiency with Technology

(I am proficient in the use of ___. 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) % Responding 4 or 5	(c) Mean Values	(d) % Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Word processor	4.63	95.4%	4.50	90.5%	-0.13	-4.9%	0.001**
Spreadsheet software	4.05	76.2%	3.79	63.3%	-0.26	-12.9%	0.000**
Presentation software	3.97	73.0%	4.24	81.6%	0.27	8.6%	0.000**
Database software	2.91	29.3%	2.68	26.5%	-0.23	-2.8%	0.016*
Internet	4.66	95.7%	4.67	94.5%	0.01	-1.2%	0.193
Web-based search engines	4.68	96.2%	4.64	93.7%	-0.04	-2.5%	0.066
Library-based search engines	3.27	45.4%	3.03	35.2%	-0.24	-10.2%	0.016*
E-mail	4.75	96.7%	4.59	92.3%	-0.16	-4.4%	0.000**
Online discussion forums	3.92	69.7%	3.67	59.6%	-0.25	-10.1%	0.001**

†Chi square test **= significant at the 1% level, *= significant at the 5% level

2004 to AY 2014, implying that current digital natives are not as confident in using various technological tools as their counterparts from 10 years ago. Chi square test indicates that six of the seven items were statistically significant at 5% level. The only item that they rated themselves higher than students from 10 years ago with any statistical significance (p-value = 0.000) is in the use of presentation software. In addition, based on mean CSE values, students from AY 2004 seem to be most confident in their ability to use e-mail programs, followed by web-based search engines and the Internet, while students from AY 2014 are most confident using the Internet, followed by web-based search engines and e-mail programs. These differences are perhaps driven by the emergence of social media and texting applications during last 10 years, which puts less importance on e-mail as the main communication tool.

Students' Technology Preferences

For classroom instruction, current digital native students prefer to see more visual aids and more frequent use of the Internet than students from 10 years ago do, as shown in Table 3 (Panel A). Mean values for video and digital document projection increased from 3.86 and 4.02, respectively, in AY 2004 to 4.01 and 4.14, respectively, in AY 2014. The increase is statistically significant at 5% level with a p-value of 0.018 for Video projection preference, but for Digital document projection preference, it is not statistically significant. However, more than 70% of current students marked either 4 (agree) or 5 (strongly agree) on the survey item, showing preference toward both video and digital document projections in class, which indicates that they are more comfortable with visual information than students from 10 years ago. Internet use in class is not as strongly preferred as visual aids with mean values of 3.23 in AY 2004 and 3.44 in AY 2014, but the positive change from 10 years ago to today is statistically significant at 1% level (p-value = 0.000). Current students, however, are less likely to be inclined to work in the computer workstation environment. The mean survey value for the computer workstation item declined from 3.36 in AY 2004 to 3.09 in AY 2014 (p-value = 0.001), while the percentage of students who responded with either 4 or 5 declined from 43.4% in AY 2004 to 33.3% in AY 2014. Results by year of study, shows students' technology skills improve as they advance from first-year-students to seniors. Once again, these results are excluded from this paper for brevity.

On the other hand, students tend to prefer academic assistances offered through class websites (Table 3-Panel C). In both time periods, students responded overwhelmingly positively to a variety of study materials including course notes, exam preparation materials and answer keys. Six out of ten survey items, in fact, have mean values higher than 4.0 and 5 of those items have more than 80% of students responding with either 4 or 5. However, discussion

Table 3
Students' Technology Preferences
Panel A: Classroom Instruction

(I prefer ____ to be used for classroom instruction. 1 = Strongly Disagree / 3 = Neutral / 5 = Strongly Agree)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Video projection	3.86	66.7%	4.01	72.5%	0.15	5.8%	0.018*
Digital document projection	4.02	74.3%	4.14	78.3%	0.12	4.0%	0.149
Physical document projection	3.40	44.1%	3.47	49.3%	0.08	5.2%	0.016*
Internet	3.23	34.3%	3.44	47.2%	0.21	12.9%	0.000**
Multiple computer workstations	3.36	43.4%	3.09	33.3%	-0.27	-10.1%	0.001**

Panel B: Out-of-Class Assignments and Activities

(I prefer ___ to be used for out-of-class activities. 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Internet use	3.89	68.5%	3.95	70.2%	0.06	1.7%	0.410
Computer simulations	3.46	47.6%	3.44	49.3%	-0.02	1.7%	0.179
Web-based search engines	3.84	64.5%	3.82	64.5%	-0.02	0.0%	0.476
Library-based search engines	2.94	31.3%	2.66	24.1%	-0.28	-7.3%	0.004**

Panel C: Available Content or Technology on Class Website

(I prefer ___ to be available on a course website. 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Course notes	4.39	87.3%	4.53	89.5%	0.14	2.2%	0.015*
Self-study quizzes	4.35	85.9%	4.40	82.2%	0.05	-3.7%	0.250
Exam prep materials	4.62	93.6%	4.65	93.1%	0.03	-0.5%	0.470
Online exams	3.35	45.8%	3.28	45.4%	-0.07	-0.4%	0.476
Answer keys/solutions	4.47	89.4%	4.48	88.9%	0.01	-0.5%	0.679
Homework solutions	4.58	93.4%	4.58	92.1%	0.00	-1.3%	0.730
Electronic submissions	4.07	74.5%	4.00	70.1%	-0.08	-4.4%	0.062
Class discussion forums	3.21	38.2%	2.99	30.7%	-0.22	-7.6%	0.014*
Small group discussion forums	3.09	33.4%	2.82	24.6%	-0.27	-8.8%	0.010*
Instant messaging tools	2.72	23.8%	2.91	30.4%	0.20	6.5%	0.027*

†Chi square test **= significant at the 1% level, *= significant at the 5% level

forums are among the least preferred items for both time periods and current students are less likely to have positive opinions for them than students from 10 years ago did. The mean values for class discussion forums and small discussion forums declined from 3.21 and 3.09, respectively, in AY 2004 to 2.99 and 2.82, respectively, in AY 2014. These declines are statistically significant with p-values of 0.014 and 0.010, for Class discussion forums and Small group discussion forums, respectively. Similarly to changes in students' proficiency in e-mail use, these changes are perhaps, again, due to the proliferation of social media (e.g. Facebook, Instagram, Twitter, Tumblr, etc.), which leads to lessening the need for students to use online forums to discuss class materials.

Perceived Benefits of Technology

The survey results showing students' perceived benefits of technology in supporting learning processes are consistent with their technology preferences (see Table 3). For classroom instruction (Table 4-Panel A), students are typically in favor of various technologies including video materials, lecture notes, projected documents and the Internet use. In addition, mean values for four out of five survey items show positive changes from AY 2004 to AY 2014, indicating current digital native students are more likely to perceive instructors' adoption of video materials, PowerPoint slides, and contents from the Internet to be beneficial to their learning process. The change in percentage of students who responded with either 4 or 5 from AY 2004 to AY 2014 confirms same trends for those four items. The use of computer workstations, meanwhile, is not viewed as beneficial as other technologies; the mean value declined from 3.60 in AY 2004 to 2.94 in AY 2014 and the percentage of students who responded with either 4 or 5 also decreased from 48.4% in AY 2004 to 38.6% AY 2014. All results are statistically significant at either 1% or 5% level.

For out-of-class assignments and activities, results for whether technology enhances ability to learn are mixed (Table4-Panel B). Mean values for use of the Internet and web-based search engines rose from 3.87 and 3.70, respectively, in AY 2004 to 4.10 and 4.00, respectively, in AY 2014 with a p-value of 0.000 for both Internet use and Web-based search. Meanwhile, mean values for use of the computer simulations and library search engines dropped from 3.66 and 3.30, respectively, in AY 2004 to 3.43 and 2.85, respectively, in AY 2014, but they are not statistically significant. The results from the changes in percentage of students who responded with either 4 or 5 also show mixed trends. In summary, current digital native students responded more positively to the perceived benefits of using the Internet and web-based search engines in learning process than their counterparts from 10 years ago did. However, the results are inconclusive regarding students' perceived benefits from computer simulations and library search engines.

IMPLICATIONS AND CONCLUSIONS

It is somewhat puzzling to see that today's digital native students do not perceive themselves as proficient as students from 10 years ago. As it stands, we can only postulate plausible rationale for these discrepancies, but they certainly do fly in the face of most current research and supposition. With numerous technological advancements and ease of access to multiple devices, one would assume that today's students would perceive themselves as more confident in their abilities to handle various technological tools. However, the survey results imply that is not the case. Maybe as today's students are more likely to be focusing on consuming various content on the Internet and connecting through social media with their smartphones they are less likely to be using technology activities only for coursework compared to their counterparts from 10 years ago. They may be limited by what the phone in their hand can accomplish and, since many office productivity tools (spreadsheets and especially databases) are not among the most widely used applications on their phones, this may hamper those efforts.

Anecdotally, we see very few states with technology literacy, let alone business technology literacy, amongst their core curricula in K-12 education. Word and PowerPoint require only minimal background skills in order to be proficient, but both Excel and Access require basic math and logical thinking skills beyond everyday knowledge in order for a student to attempt to be a novice user. Databases are just now beginning to make their way into the application areas of todays' businesses, so it is not unexpected to see students with very little exposure to them. However, it is surprising to find today's digital natives have lower CSE in Excel than their counterparts from 10 years ago. We would have hoped that the digital native would understand the importance of the use of spreadsheets if only to avoid doing calculations repeatedly in the same way that Word precluded the need for countless drafts and rewrites on paper. It might be because high school teachers perceive using Excel as "cheating or taking short cuts" in a math or logic class and, therefore, students are asked to work out formulas and functions "long hand" to truly grasp the course contents. Then, students may not know until shown in a college-level course the need for these types of tools in the world of work, which might also speak to the increase in CSE from the first year to fourth year in our survey data. Many of these questions

Table 4
Perceived Benefits of Technology in Supporting Learning Process
Panel A: Classroom Instruction
(The use of ___ by an instructor in class enhances my ability to learn.)
(For all panels: 1 = Strongly Disagree, 3 = Neutral, 5= Strongly Agree)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Video material	3.50	48.7%	3.79	64.6%	0.29	15.9%	0.000**
Digital document projection	3.82	67.7%	4.18	83.6%	0.36	16.0%	0.000**
Projected documents	3.54	53.5%	3.69	60.3%	0.15	6.8%	0.004**
Internet	3.48	49.7%	3.76	64.1%	0.28	14.4%	0.000**
Multiple computer workstations	3.60	57.6%	2.94	43.8%	-0.67	-13.8%	0.000**

Panel B: Out-of-Class Assignments and Activities
(The use of ___ for out of class activities enhances my ability to learn.)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Internet	3.87	70.0%	4.10	77.0%	0.24	7.0%	0.000**
Computer simulations	3.66	57.4%	3.43	62.4%	-0.23	5.0%	0.462
Web-based search engines	3.70	61.0%	4.00	73.1%	0.29	12.1%	0.000**
Library-based search engines	3.30	46.4%	2.85	44.1%	-0.44	-2.3%	0.656

Panel C: Available Content or Technology on Class Website
(Providing ___ on a course website enhances my ability to learn.)

	2004		2014		Data Comparison		
Technology	(a) Mean Values	(b) Percent Responding 4 or 5	(c) Mean Values	(d) Percent Responding 4 or 5	(c) – (a)	(d) – (b)	p-value†
Posted lecture notes	4.33	86.8%	4.53	91.2%	0.20	4.3%	0.000**
Self-study quizzes	4.45	89.3%	4.42	89.1%	-0.04	-0.2%	0.451
Exam prep materials	4.50	94.8%	4.70	95.1%	0.20	0.4%	0.002**
Online exams	3.04	37.1%	3.10	44.9%	0.06	7.8%	0.031*
Answer keys/solutions	4.09	88.1%	4.40	88.4%	0.31	0.2%	0.832
Homework solutions	4.40	88.1%	4.45	89.8%	0.05	1.7%	0.352
Electronic submissions	3.35	44.2%	3.46	53.5%	0.11	9.3%	0.001**
Class discussion forums	3.16	41.5%	2.75	38.2%	-0.41	-3.3%	0.552
Small group discussion forums	3.08	38.6%	2.71	38.3%	-0.37	-0.3%	0.535
Instant messaging tools	2.79	29.5%	2.41	31.9%	-0.38	2.5%	0.244

are indeed fodder for future research into the "why" of our findings.

The survey results seem to bring up more questions than they answer. It is important to recognize the limitations of our study as we did make some minor changes in the instrument from ten years ago due to changes in technology, for example excluding the DVD and CD references. We also did not include new forms of technology (smartphones, tablets and the different platforms for each) which may be a lapse ten years from now if someone wants to continue this comparison. Moreover, surveying students from either different colleges or regions may alter the results and draw different conclusions from this study. However, before universities make significant investment decisions in technology to keep up with competition, it is important to clearly identify and understand underlying factors that influence digital natives' preference toward different types of technology and their impact on teaching and learning. Hence, further studies should attempt to dig to the core of the "why" current students perceive themselves as less proficient in technology and discover ways to deploy various technological resources more effectively in order to achieve better return on the technical investment.

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