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# Impact of Technology Devices on College Students' Comfortable Levels of Using Technology

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The purpose of this exploratory study was to find out college students' comfortable levels of using technology. Forty-four males (11.3%) and 345 females (88.5%) participated in the study by filling out an online survey voluntarily. The researchers used descriptive data analyses to investigate the possession of, access to, and usage of technology devices among college students. They also used a one-way ANOVA to explore whether or not there was a significant difference in the mean scores of the comfortable levels of college students' usage of technology among those who owned different number of technology devices. A significant difference was found between the comfortable level of using technology and college students who owned different number of technology devices. As technology is more accessible and more frequently used in learning environment, there is an increasing needs of faculty profession development to better prepare faculty members for the changed students' needs on technology and for ensuring their comfort with varied technologies and their use. The results of this study were used to provide recommendations to instructors on technology use in the classroom within a pedagogically sound framework.

Keywords: technology, college student, comfortable level

## INTRODUCTION

There is an increasing demand to offer online teaching using multiple approaches to instructional technology in order to more effectively teach students from Kindergarten through post-secondary education. However, what are the students' real learning needs, and how to create a learning environment to better meet students' learning needs? Do the instructors get sufficient training, professional development, and resources to help them teach better with technology? The purpose of this exploratory study was to find out college

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students' comfortable levels of using technology. The results of this study are used to provide some practical suggestions for online and hybrid instructors based on the survey data regarding technology's impacts on teaching and learning.

## **LITERATURE REVIEW**

### *USE OF TECHNOLOGY FOR TEACHING AND LEARNING*

There is an increasing demand and expectation for teachers at all levels of instruction, including post-secondary level, to be aware of and to implement technology in teaching practices in order to enhance student learning outcomes. Yet, more typical instructional practices have been limited to conducting traditional activities via different media formats (Price & Kirkwood, 2014; Blin & Munro, 2008; Price, Richardson, & Jelfs, 2007; Roberts, 2003). Some studies (Marshall, 2002) indicate technology increases the students' flexibility in learning. However, only a few studies showed technology had led to changes in practice in teaching and learning (Price & Kirkwood, 2014). Kulesza, DeHondt, and Nezelek (2010) stated that technology did not improve learning experience. On contrary, it may decrease students' interest in learning, increase their dependence on technology, reduce their engagement, and increase distraction (Kulesza, DeHondt, & Nezelek, 2010).

At Kindergarten through 12 Grade level, technology also plays an important role in teaching and learning. The results of a meta-analysis identified hybrid teaching as the most effective instruction approach to yield better student learning outcomes than entirely online and entirely face-to-face models. Additional learning time and instructional elements contribute to the effectiveness of hybrid teaching, rather than the use of media and technology alone (U.S. Department of Education, 2010). However, this increased use of technology as an instructional tool requires instructors to become more proficient with technology and to use it within a pedagogically sound framework (Muwanga-Zake, 2008). Such expertise requires continuous professional development activities to both gain and maintain instructor proficiencies.

Several researchers have studied the impact of cell phone use on teaching and learning. Elder (2013) found that college students have increased both their use and reliance upon cell phones in and outside of the college classroom. Burns and Lohenry (2010) studied college students and faculty's perceptions of cell phone use. They reported that 65% of students refrained the use of cell phones in classrooms, yet 53% used them to text during lessons, and 85% of students and faculty found cell phones in class to be distracting (Burns & Lohenry, 2010). Campbell (2006) found that the younger the students and faculty were, the more tolerance they expressed towards a ringing cell phone in class and the less supportive they were towards the restrictive policies on cell phone use in classroom. From the results of a questionnaire on the cell phone use and beliefs with 88 undergraduate students, Elder (2013) indicated that there was an acceptance of its use in class, and students reported neutral beliefs regarding whether or not they felt distracted or whether or not the use of cell phones impacted their study time negatively. In a survey on cell phone use at college level, Braguglia (2008) reported that 45% of undergraduate students majoring in business spent more than four hours per day on cell phone, and 54% used their cell phone in every class. Laptop computers were also reported to increase distraction in class (Skolnik & Puzo, 2008; Fried, 2008; Hembrooke & Gay, 2003; Wurst, Smarkola, & Gaffney, 2008; Bugeja, 2008). Skolnik and Puzo (2008) reported that 15% of students drifted away from the class topic because of other computer applications. Fried (2008) stated the use of laptop computers affected student learning negatively and also distracted peers.

*COLLEGE STUDENTS' ACCESS TO TECHNOLOGY*

The access to technology on college campuses is very common. Baker, Lusk, and Neuhauser (2012) did a comprehensive survey to the students and faculty members from three public universities across three states. Their study indicated that 90% of the participants owned a laptop computer, 99% a cell phone, 83% an MP3 player; while 56% of the students accessed to a computer through school (Baker, Lusk, & Neuhauser, 2012). In their study, students reported an average of one to two hours of cell phone use per day, compared to two to four hours of computer use per day. Almost one third of the students reported to spend more than two hours per day using a cell phone (30%), compared to 13% spent less than one hour per day using a computer (Baker, Lusk, & Neuhauser, 2012).

These results are consistent with other studies (Fallon, Russo, & Zhang, 2014) which have reported that students have access to a range of technologies, including cell phones (97%), laptop computers (93%), desk top computers (43%), and digital assistant devices (20%). Access to needed technology results in increased productivity, ability to share ideas, increased ability to complete a job well, increased ability to work with others, and the ability to learn new things (Fallon, Russo, & Zhang, 2014). However, access to technology and perceived effects on abilities does not necessarily mean that the impact on learning is always positive.

In one class, one fourth of students reported to send a text message in almost every class versus one third rarely or never sent text messages; almost one third of students reported to check texts in almost every class versus one third rarely or never check texts; while seventy percent of students reported that they never took a call in class versus six percent took a call more than once per month (Baker, Lusk, & Neuhauser, 2012). Despite the common use of technology in class, more than eighty percent of students reported rarely or never used laptops in class (Baker, Lusk, & Neuhauser, 2012). However, Baker, Lusk, and Neuhauser (2012) did not investigate college students' comfortable level of using technology. Even though the use of and access to technology on campus is widespread, it is still unanswered whether or not college students feel comfortable of using technology or how comfortable they are regarding the use of technology to enhance learning.

*FACULTY PROFESSION DEVELOPMENT FOR CHANGED STUDENTS' NEEDS ON TECHNOLOGY*

As technology is more accessible and more frequently used in learning environment, there is an increasing needs of faculty profession development to better prepare faculty members for the changed students' needs on technology. The National Staff Development Council (NSDC, 2001) promotes professional development models that include learning communities, leadership, empirically based instruction, equity, resources, quality teaching, family involvement, evaluation, and data-driven decisions (Brodie, 2013; Gall & Vojtek, 1994; Joyce & Showers, 1988; Knight, 2007; Senge, Kleiner, Roberts, Ross, Roth, & Smith, 1999). Despite the fact that traditional one-day professional development sessions, conference attendance, and even some college courses as a means for professional development do not increase educators' skills, nor do they lead to sustainable practices (Alber & Nelson, 2010; Erickson, Noonan, & McCall, 2012; Ludlow, 2007); however, this "train and hope" method is still utilized across the country. There is a need to move beyond such ineffective practices and utilize meaningful professional development opportunities for educators (Mueller & Brewer, 2013; Mizell, 2001). Professional development is most effective the following conditions are taken into account: (1) when there are clear research-based expectations for what teachers should know and be able to do to support student learning, (2) when it takes place in professional learning communities, (3) when there is

collaborative leadership and shared responsibility for improving teaching and learning, (4) when it is job embedded, directly relevant to classroom practice, provide over time, provides opportunities for practice of new strategies, time to reflect on changes, and time to integrate new learning into the teaching practice, and (5) when adequate resources are provided (The University of the State of New York & the New York State Education Department, 2013).

The Faculty Learning Community (FLC) can be one model that educational institutions from kindergarten through post-secondary levels use to prepare faculty members for adaptations of instruction to meet the students' needs. An FLC is usually composed of six to fifteen faculty and professional staff across different disciplines build a genuine community, make a year-long commitment, and engage in active and collaborative professional development conceived as learning (Cox, 2004; Shulman, 1993; Ortquist-Ahrens & Torosyan, 2009; Zhang, LeSavoy, Lieberman, & Barrett, 2014). Among the ten qualities essential to the success of FLCs identified by Cox (2011), safety and trust, openness, respect, relevance, challenge, responsiveness, collaboration, and esprit de corps are correlated with some of the features brought up by The University of the State of New York & the New York State Education Department (2013) on how to establish an effective professional development in college and university settings.

#### *MEASURING COMFORT LEVELS OF USING TECHNOLOGY IN STUDENTS*

Much of the research in technology has focused on the ease of access and usage of various forms of technology (Burns, & Lohenry, 2010; Fallon, Russo, & Zhang, 2014; Fried, 2008; Quan-Haase, 2008). Very little research is available on the impact of technology on the comfort level of students or on the impact of the instructor's use of technology on the comfort levels of students. Only one study was found that linked the perceived use of technology to the perceived positive acceptance level of the user (Muwanga-Zake, 2008, p. 288). However, when focus groups were used to further explore the perceived acceptance level of the participants in that study, a majority of negative comments by participants were recorded (pp. 290-291). No other studies were identified that focused directly on the comfort levels of the users of technology.

In many of the studies reviewed, the comfort level of the user was simply assumed to be positive when given wide use of the technology. One example of this is a study that focused on the use of Instant Messaging (IM) among college students (Quan-Haase, 2008, p. 107). This study found that heavy or frequent use of IM was associated with perceived intimacy in relationships. However, no data was presented that investigated the comfort level or measured the levels of intimacy of the participants. In another study, the researchers (Kaya, Özay, & Sezek, 2008, p. 28) suggested that the increased engagement of students could lead to a more positive classroom environment. The more positive classroom environment was a recommendation of the researchers rather than an outcome of the data presented. Some researchers seem to have assumed that increased use of technology leads to positive outcomes in users. However, the lack of direct evidence in these and other studies in the research literature has lead the researchers in this study to attempt to directly measure the impact of technology on the comfort level of college students.

#### **METHODS**

This was a part of a larger study, focusing on a different set of data from a much larger database to answer a different set of research questions. The purpose of this

exploratory study was to find out the impact of different technology devices on college students' comfortable level of using technology. The research questions were: (1) What are the possession of, access to, and usage of, current and available technology devices among college students? (2) Is there any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different number of technology devices?

### *PARTICIPANTS*

Forty-four males (11.3%) and 345 females (88.5%) participated in the study by filling out an online survey voluntarily. They were all undergraduate students who took introductory family studies courses from a public university located in northeast of the United States. Majority of them were traditional college students, ranging from 18 to 23 years of age ( $n = 376$ , 96.4%). One hundred and twelve participants reported as freshman (28.7%), 116 sophomores (29.7%), 108 juniors (27.7%), and 53 seniors (13.6%) (Fallon, Russo, & Zhang, 2014).

### *SURVEY INSTRUMENT DEVELOPMENT*

A survey instrument was developed to understand the usage of current and available technology devices for college student and its impact on college students' life, including their learning. Survey items were selected and adapted from a variety of instruments measuring technology use, including the Princeton Survey, Research Associates International for The Pew, Internet and American Life Project (Fallon, Russo, & Zhang, 2014).

### *DATA ANALYSES AND PROCEDURE*

The authors selected the items from the survey instrument related to this study to answer these two research questions: (1) What are the possession of, access to, and usage of, current and available technology devices among college students? (2) Is there any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different number of technology devices? Five questions were asked to seek information on college students' possession of technology: "Do you have the following (desktop computer, laptop computer, cell phone, personal digital assistant device, and/or television set)?" The participants' answers to these questions were coded as 0 (no) or 1 (yes). Similar coding system was used for the answers of college students' access to and usage of technology devices. Descriptive analyses were used to analyze the frequency and percentage of college students' possession of, access to, and usage of different types of technology.

Due to the lack of a defined "comfort" in the existing literature, the authors used eight questions in a 1-5 Likert scale to ask about the participants' comfortable level of using technology. The participants were asked to rate whether each of the eight statements described them from 1 (not at all), 2 (not too well), 3 (well), 4 (somewhat), or 5 (very well). The eight questions were: (1) "I like the cell phones and other mobile devices allow me to be more available to others;" (2) "I do NOT feel like my electronic devices can do more than what I actually use them for;" (3) "When I get a new electronic device, I do NOT need someone else to set it up or show me how to use it;" (4) "It is NOT stressful to own and manage all of the different electronic devices I have;" (5) "I do NOT feel annoyed by having to respond to intrusions from my electronic devices;" (6) "I believe I am more productive because of all of my electronic devices;" (7) "I do NOT feel stressed if my electronic devices are not available;" and (8) "When thinking about ALL of the information and communication devices I use, overall, I would say these devices make my life EASIER

and not COMPLICATED.” The participants’ answers to these questions were coded one through five as they were indicated in the Likert scale. The higher a participant rated the statement, the more comfortable he/she may feel towards using technology in that specific aspect. Thus, the mean score of each participant’s answers to all eight questions was calculated (from the possible minimum of one to the possible maximum of five). The higher the mean score, the more comfortable the participant felt when using technology. Since only one participant indicated the possession of no technology (0.3%), and less than one sixth of the participants reported owning two or fewer devices ( $n = 57$ , 14.7%), the participants were divided into four groups based on the number of technology devices they owned: Group One owned two or fewer technology devices, Group Two owned three, Group Three owned four, while Group Four owned all five. Then a one-way Analysis of Variance (ANOVA) was conducted to see if there was any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different number of technology devices.

#### *RELIABILITY AND VALIDITY*

After data collection, the authors computed a standardized Cronbach’s alpha for the internal consistency among all the survey items, and the reliability was .714 for total survey. To increase content validity, expert appraisal of the survey instrument was sought. A three member panel of experts in education and technology examined the face and content validity of the final version of the survey instrument. Their comments were incorporated into the discussion section of this paper. No additional pilot testing of the instrument was completed (Fallon, Russo, & Zhang, 2014).

### **RESULTS**

The authors reported the descriptive analyses results with the frequency and percentage of the survey items to answer Research Question One “What are the possession of, access to, and usage of, current and available technology devices among college students?” In addition, they conducted one-way Analysis of Variance (ANOVA) to answer Research Question Two “Is there any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different technology devices?”

#### *DESCRIPTIVE ANALYSES FOR RESEARCH QUESTION ONE*

Among 389 participants, the majority of the participants reported to have possession of a laptop computer ( $n = 364$ , 93.3%), a cell phone ( $n = 380$ , 97.4%), and their own television set with them at school ( $n = 307$ , 78.7%). Accordingly, the majority of the participants primarily used a laptop computer to send and receive emails ( $n = 309$ , 79.2%), while the majority of them used a cell phone to make most of their phone calls ( $n = 378$ , 96.9%) and to send or receive text messages ( $n = 371$ , 95.1%).

Despite of the fact that over three quarters of the students had their own television set with them at school, even more students reported to have access to a television set ( $n = 361$ , 92.6%), yet the majority used a computer to watch TV ( $n = 285$ , 73.1%). Almost half of them reported to watch television every day or almost every day ( $n = 181$ , 46.4%), while over one fifth spent three hours or more watching TV ( $n = 86$ , 22.1%). The majority of the participants reported going online or using e-mails at least three times a day ( $n = 362$ , 92.8%).

To sum up, the college students who participated in this study indicated different numbers regarding the possession of and access to different technology devices, including a desktop computer, laptop computer, cell phone, personal digital assistant (PDA), and/or

television set. The participants also indicated different numbers regarding usage of different technology devices, including making a call, watching TV, sending an e-mail, and/or sending a text message.

Table 1. *Descriptive Analyses by Possession of, Access to, and Use of Technology*

Variable	Frequency n	Percentage (%)	
<i>Possession of Technology</i>			
Desktop Computer	170	43.6	
Laptop Computer	364	83.3	
Cell Phone	380	97.4	
TV at school	307	78.7	
PDA	64	16.5	
<i>Access to Technology</i>			
Had access to TV	361	92.6	
Watched TV every day or almost every day	181	46.4	
Watched TV a few times a week	157	40.3	
Watched TV a few times a month or less often	45	11.5	
Never watched TV	5	1.3	
Spent three hours or more watching TV per day	86	22.1	
Spent one to two hours watching TV per day	194	49.7	
Spent less than one hour watching TV per day	109	27.9	
Watched TV on a computer	285	73.1	
Watched TV on an iPod	30	7.7	
Watched TV on a cell phone	18	4.6	
Went online or used e-mails at least three times per day	362	92.8	
Went online or used e-mails twice or less per week	27	6.9	
<i>Use of Technology</i>			
To send an e-mail	Laptop Computer	309	79.2
	Desktop Computer	42	10.8
	Cell Phone	14	3.6
	PDA	13	3.4
To make a call	Cell Phone	378	96.9
To send a text message	Cell Phone	371	95.1

Table 2. *More Detailed Descriptive Analyses by Possession of Technology Devices*

Variables	Sum (N)	Mean	Standard Error	Standard Deviation
Desktop Computer	170	.44	.025	.497
Laptop Computer	364	.94	.012	.237
Cell Phone	380	.99	.006	.113
PDA	64	.17	.019	.376
TV	307	.80	.020	.401
Number of Technology Devices	1,285	3.30	.042	.831
Mean of Comfortable Level of Using Technology	--	3.61	.028	.561

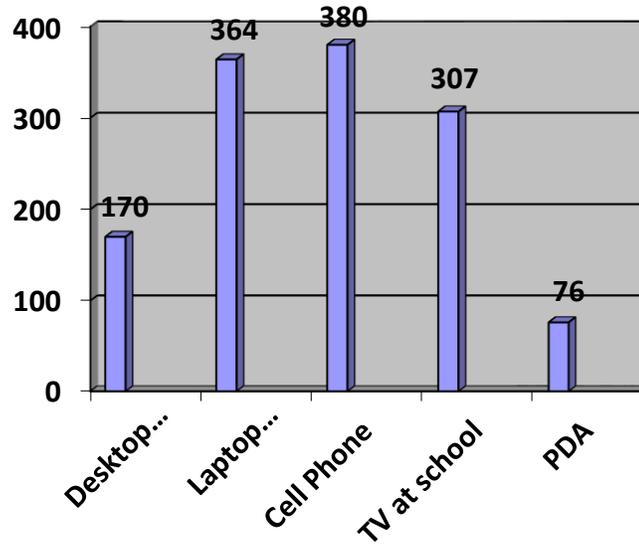


Figure 1. College Students' Possession of Technology Devices

*INFERENCE ANALYSES FOR RESEARCH QUESTION TWO*

The authors used a one-way ANOVA to investigate whether or not there was any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different number of technology devices. A significant difference in the mean scores of the comfortable levels of college students using technology was found among the college students who owned different number of technology devices ( $F = 4.46, p = .004$ ). The more technology devices the participants owned, the more comfortable they felt when using technology.

Table 3. *One-Way ANOVA Analyses in Mean of the Comfortable Level of Using Technology*

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	4.093	3	1.364	4.455**	.004
Within Groups	117.915	385	.306		
Total	122.008	388			

Note: \*\* indicates that the mean difference is significant at the 0.01 level.

Table 4. *Post Hoc Tests in Mean of the Comfortable Level of Using Technology*

	Group	Group	Mean Difference	Standard Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Tukey HSD	0	1	-.102	.084	.618	-.320	.115
		2	-.191	.088	.133	-.418	.036
		3	-.449**	.133	.004	-.792	-.107
	1	0	.102	.084	.618	-.115	.320
		2	-.088	.064	.510	-.253	.076
		3	-.347*	.118	.019	-.652	-.042

	2	0	.191	.088	.133	-.036	.418
		1	.088	.064	.510	-.076	.253
		3	-.258	.121	.143	-.570	.053
	3	0	.449**	.133	.004	.107	.791
		1	.347*	.118	.019	.042	.652
		2	.258	.121	.143	-.054	.570
Scheffe	0	1	-.102	.084	.689	-.339	.134
		2	-.191	.088	.196	-.438	.056
		3	-.449*	.133	.010	-.822	-.076
	1	0	.102	.084	.689	-.134	.339
		2	-.088	.064	.591	-.268	.091
		3	-.347*	.118	.036	-.679	-.015
	2	0	.191	.088	.196	-.056	.438
		1	.088	.064	.591	-.091	.268
		3	-.258	.121	.208	-.598	.081
	3	0	.449*	.133	.010	.076	.822
		1	.347*	.118	.036	.015	.679
		2	.258	.121	.208	-.081	.598

Note: \* indicates that the mean difference is significant at the 0.05 level;  
 \*\* indicates that the mean difference is significant at the 0.01 level.

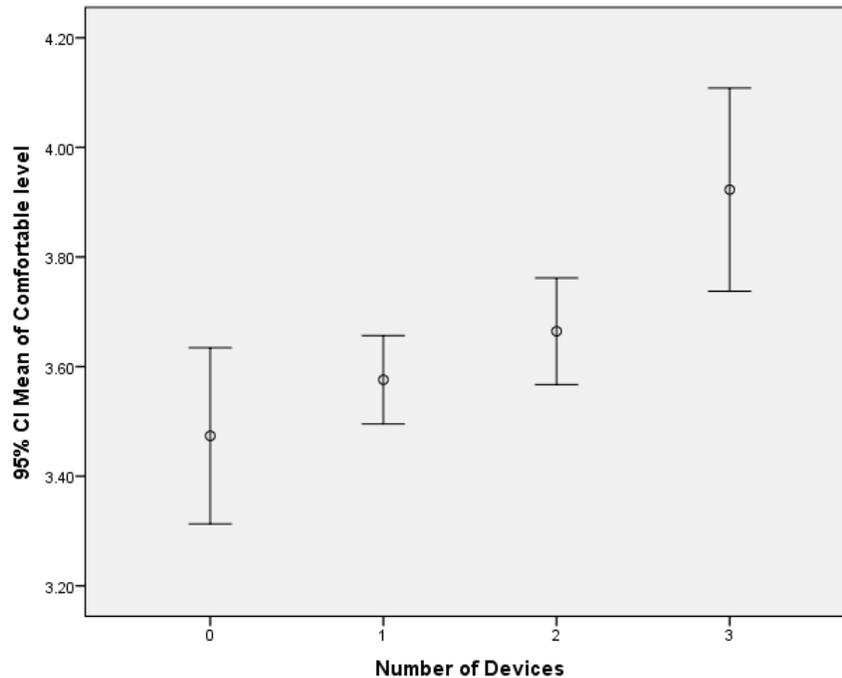


Figure 2. Mean Scores of the Comfortable Level of Using Technology Based on the Number of Technology Devices College Students Owned

Furthermore, correlation coefficient was used to find out whether or not the mean scores of the comfortable levels of college students using technology was correlated with the number of technology devices they owned. A correlation was found between the mean

scores of the comfortable levels of college students using technology and the number of technology devices these college students owned ( $r = .17, p = .001$ ). The number of technology devices the participants owned correlated positively with the comfortable level they had when using technology.

Table 5. *Correlation Analyses between the Number of Technology Devices Owned and the Comfortable Level of Using Technology*

Variable		Mean Score of the Comfortable Level of Using Technology
Number of Technology Devices Owned (2 or Less, 3, 4, or 5)	Pearson	.173**
	Correlation	
	Sig. (2-tailed)	.001
	N	389

Note: \*\* indicates that correlation is significant at the 0.01 level.

## DISCUSSION

The research questions investigated in this study were: (1) What are the possession of, access to, and usage of, current and available technology devices among college students? (2) Is there any significant difference in the mean scores of the comfortable levels of college students using technology among those who own different technology devices?

Results of this study are consistent with that of other researchers (Fallon, Russo, & Zhang, 2014; Baker, Lusk, & Neuhauser, 2012) demonstrating that access to various forms of instructional technology has become more widespread and accessible to students. However, the results of this study showed that, even though most of the participants had possession of, access to, and used technology, there were still students who did not feel comfortable about using technology, and technology led to feelings of negative impacts on students' learning, including stress, distraction, and addiction. Thus, instructors need to provide support to this "tech-savvy" generation so that technology can be used to create a positive learning environment to help their learning. That needed support may mean additional professional development opportunities for instructors.

### LIMITATIONS

The results of this study may be generalized to students and instructors at varying levels, from Kindergarten to postsecondary. However, the results of this study are limited in several ways. The first limitation is that all participants were volunteers and self-reported their perceptions about technology use and impacts. Next, the participants were all college students and were primarily female. The results of this study might be different for younger students in kindergarten- Grade 12 schools and for primarily male students. Several researchers have found significant differences in technology proficiency and usage based on gender (Baker, Lusk, & Neuhauser, 2012). Lastly, all the participants came from a single course at a northeastern university. A more diverse population from different schools, majors, countries, or regions might yield differing results.

## CONCLUSIONS

Instructors contribute enormously to a positive learning climate in the classroom setting. They need to continue to use effective instructional technologies in order to reach and teach all students. They also need to work to educate all students on how to best utilize these forms of technology and communication devices as effective means of human and

interpersonal interactions. One important conclusion of this study, however, is that the comfort levels of users, both positive and negative impacts, should be further investigated. The assumption that comfort increases with use may not be the case in all situations or with all users of technology.

#### *RECOMMENDATIONS ON THE USE OF CELL PHONES*

Elder (2013) found that college students (and other frequent users of cell phones in varied contexts) are truly becoming better at multi-tasking and no detriments occur with the concurrent use of a cell phone during class. However, Baker, Lusk, & Neuhauser (2012) found that over two thirds of their participants agreed that students should turn off cell phones if required by instructors. Given the contradictory information that many students continue to use cell phones during class, even when instructed to turn off the devices, it makes sense that instructors make use of cell phones and monitor usage instead of limiting access to devices. Therefore, it seems that instructors can easily make use of cell phones, especially smart phones, by embedding their use in certain class activities. Instructors should ensure that all students have the appropriate apps on their phones or to group students working together to solve problems using the appropriate apps.

#### *RECOMMENDATIONS ON THE USE OF LAPTOPS*

In the study by Baker, Lusk, & Neuhauser (2012), a majority of respondents strongly agreed that laptop use in the classroom is appropriate. However, respondents did express some concern about laptop use for surfing the web in class, with 46% agreeing or strongly agreeing that it is distracting. The question of how laptops promote student learning is of importance. A study by Aguilar-Roca, Adrienne and O'Dowd (2012) found that students who preferred to take class notes on paper over those taking notes on a laptop performed better on exams. In addition, Ragan, Jennings, Massey and Doolittle (2014) found that unregulated laptop use in class related to students engaging in off-task activities. Faculty may want to consider implementing policies about laptop use in their classroom that restricts when and where they can use them.

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