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What Do College Students Really Want When it Comes to Their Instructors' Use of Information and Communication Technologies (ICTs) in Their Teaching?

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Abstract. In fall 2014 we surveyed 311 students who had been enrolled at least one semester in two Canadian junior/community colleges. We inquired about their views, experiences, and recommendations about ICTs used in their college by their instructors in face-to-face classes in various programs of study. Results show that students consistently preferred that their instructors use ICTs in their teaching, including lectures as well as individual and group work in class. Students in all programs liked most forms of commonly used ICTs used by faculty in their teaching (e.g., PowerPoint, videos, CMS features). However, they disliked digital textbooks, online courses, collaborative work online, discussion forums, blogs, chat rooms, instant messaging, and all forms of communication using social networking when used by faculty (e.g., Facebook). Students' views about what ICT-related experiences worked especially well and poorly for them are presented, along with their recommendations about what colleges and instructors need to change.

Keywords: information and communication technology; ICT; college; students; professors

Introduction. Use of information and communication technologies (ICTs) in postsecondary education has become ubiquitous, and college students and instructors have jumped enthusiastically into the fray (e.g., Cassidy & Scapin, 2013). ICTs used by faculty in their teaching embrace a very large variety of tools including course/learning management systems (CMS/LMS – e.g., Moodle), social media (e.g., Facebook, Twitter), email, presentation software (e.g., PowerPoint, Prezi), cloud and web based applications (e.g., Google Drive), as well as tablet and SmartPhone apps. Technology champions have encouraged their colleges to invest in interactive whiteboards (e.g., SmartBoard), social experiments such as the "flipped" or "active learning" classrooms (Galway, et al., 2015; Lasry, Dugdale, & Charles, 2014; Rockich-Winston, et al., 2015), as well as

in seminars on the use of ICTs by instructors (e.g., APOP, undated; ProfWeb, undated).

Global questions such as, "Does more extensive use of ICTs by instructors ensure better learning?" and "Is teaching using ICTs seen as more or less effective by students and instructors?" have been shown to be overly simplistic (Abrami et al., 2006; Bell & Federman, 2013; NMC Horizon Report, 2013). Furthermore, results of investigations using more sophisticated questions regarding specific forms of ICTs used by faculty and students are inconsistent (Charles, Lasry, & Whittaker, 2013; Raby, Karsenti, Meunier, & Villeneuve, 2011; Venkatesh, et al., in press; Roy & Poellhuber, 2012). Such inconsistency is to be expected given that technology-centric approaches do not meaningfully incorporate the critical determinants of ICT effectiveness: teaching context (cf. Barrette (2009). Thus, it is an urgent priority to evaluate *which* types of ICTs work well to support student achievement and engagement, for *which* students, under *what* circumstances.

For research to translate into high quality instruction, it is vital that faculty have good guidance on how and when to use various types of ICTs to maximize effectiveness and encourage student motivation and engagement. Yet, randomized controlled trials of teaching using ICTs have serious methodological limitations (Bowen, Chingos, Lack, & Nygren, 2012) and existing studies provide conflicting results. Our investigation takes a different approach as our goal was not merely to explore the opinions of students about what they like. Instead, we examined the perceived effective use of ICTs in diverse teaching contexts by taking full advantage of the abundance of technologically supported instructional activities that take place in the colleges.

The goal of this descriptive and comparative study was to advance the current state of knowledge by integrating teaching context. To do so, we sought to:

1. Identify which ICT-related practices of college instructors in traditional face-to-face teaching are seen as effective
   - by male and female college students
   - who are enrolled in three types of programs: the arts, the social sciences, and the sciences
   - when these are used in lecture and group work in face-to-face classes.
2. Understand which ICT-related teaching practices of instructors are seen by students as exceptionally good and exceptionally poor practices, and
3. Note students' suggestions about what can be improved.

Method. The research protocol was approved by Dawson College's Research Ethics Board (REB). First, we administered a brief demographic questionnaire to 1384 students enrolled in 56 compulsory courses in two large Montreal area public junior/community colleges. These colleges award a diploma/associate's degree either in two-year pre-university streams of study (this is required before students can enroll in three-year university bachelor's programs) or 3-year career/technical programs which qualify graduates for employment (e.g., nursing, chemical technology). This questionnaire was administered to obtain

contact information of students over 18 who had completed at least one semester of college studies and who indicated a willingness to participate in future studies. Of the 437 students whom we contacted by email, 311 (71%) completed a 20 minute online questionnaire, in English or French, about their college ICT-related experiences.

Participants. Three-hundred and eleven students (126 male, 183 female, 2 did not indicate) participated. They attended an English (n=150) or a French language (n=161) large public college in Montreal. Students were enrolled in pre-university or career/technical programs in (a) creative and applied arts (n=55; includes disciplines such as literature, fine arts), (b) social science and business (n=157; includes psychology, business administration), and (c) science, engineering, medical technologies (n=96; includes nursing, chemistry). Three did not indicate their program. Mean age was 20.50 (range = 18-44). There were no significant differences between students from English and French language colleges on age or field of study. Therefore, data from these students are combined in subsequent analyses. Although there were no significant differences gender differences either, we analyzed data separately for males and females because of the preconceived notions about gender differences.

Procedure. Between October and December of 2014 students who indicated that we may contact them were directed to a web page which included a description of the study and a consent form which mentioned the $20 honorarium offered. The "continue" button brought students to the online survey. To allow for test-retest reliability calculations, 138 participants completed the questionnaire twice, a mean of 3.38 weeks apart.

Measures. We primarily used measures already validated in English and French. Measures not already validated in both languages were translated in accordance with established practice (i.e., translation and back-translation - cf. Vallerand, 1989) and validated (i.e., test-retest reliability, validation through comparison of English and French versions) (cf. Nguyen, Fichten, & Budd, 2011). Test-retest reliabilities show significant Pearson correlations with coefficients hovering around .500.

Demographic questions. These included gender, age, field of studies, and number of semesters of college education completed. We used these questions in both English and French in several of our previous investigations.

ICT-related questions (these are available in Adaptech Research Network, 2015). This online questionnaire had 10 sections.

- *Overall assessment of instructors' use of ICTs based on students' experiences with all of their college instructors.* This question used a 6 point scale with 1=terrible and 6=excellent.

Four sets of questions used 6-point Likert scaling (1=strongly disagree, 6 = strongly agree); these were modified from several sources (d'Apollonia, 2013; Fichten, et al., 2013, Raby, Karsenti, Meunier, & Villeneuve, 2011; Roy & Poellhuber, 2012; Venkatesh, et al., in press):

- *Students' expertise using ICTs* (1 item)
- *How well students liked courses and course components with and without ICTs (with ICTs = 4 items and without ICTs = 4 items) overall, in lectures, in individual work in class, and in group work in class*
- *How well students liked a variety of ICT tools used by instructors* (4 items: digital textbooks, online resources, online courses, and online group work).
- *How instructors used ICTs in their courses* (2 items)

Two sections dealt with an extensive listing (37 items) of ICT tools which college instructors may have used in their courses. These were developed in a series of meetings with team members and partner representatives:

- *What forms of ICTs were used* by the student's instructor(s) (checklist) (e.g., Moodle, PowerPoint, Facebook)
- *Whether or not different forms of ICTs worked well for students* (Yes/No); this involved determination of whether items checked by the student worked well for them.

To obtain students' preferences and suggestions, we asked three open-ended questions. These were evaluated in accordance with a coding manual (King, et al., 2015) by a team of trained coders. Students were asked to list up to three examples of instances where ICTs used by their instructors provided:

- *Especially pleasing ICT-related experiences* (i.e., ICT used in a way that worked well for them)
- *Especially annoying ICT-related experiences* (i.e., ICT used in a way that did not work well for them)

We also asked students to provide up to three

- *Suggestions for improvement* in the use of ICTs by their instructors (coding manual available in King, Jorgensen, Havel, Vitouchanskaia, and Lussier, 2015).

Results

Gender and field of study. First we examined the numbers of male and female students in the three fields of study: arts, social sciences, and physical sciences. The results indicate a significant difference, $X^2(2,306)= 8.91$, $p = .012$: close to 50% of both males and females were enrolled in the social sciences. However, females were more likely than males to be enrolled in the arts (21%), and males in the physical sciences (40%).

To ascertain the role of the language, field of study, and gender we carried out a 3-way multivariate analysis of variance (2 gender x 2 language, x 3 field of study) on all sixteen ICT-related 6-point rating scale items. Results indicate only a significant main effect of gender, $F(16,157)=2.03$, $p=.015$, and no significant interactions. Therefore, in subsequent analyses only gender was examined.

ICTs and Gender

Overall assessment of instructors' use of ICTs. There was no significant gender difference on this item. The mean score was 4.13 out of 6 (*SD* =. 75), with 62% of students indicating that their instructors were "good," and 26% indicating that their instructors were very good or excellent users of ICTs.

Students' own expertise. An independent *t*-test shows that males felt significantly more knowledgeable in the use of ICTs than did females, $t(307)=2.48$, $p = .014$. However, the effect size was small, with $d = .28$.

How well students liked courses and course components with and without ICTs used by their instructors. A series of 2 x 2 analysis of variance (ANOVA) comparisons were made (2 gender x 2 with/without ICT). Means and test results in Table 1 show that, in all cases (i.e., using ICTs in general, in lectures, in individual, and in group work in class), students significantly preferred the use of technology. For example, 93% of students indicated they liked courses which used ICTs. No significant gender main effects were found. Only one interaction was significant, suggesting that males were relatively more likely to prefer individual work with technology in class than females, and relatively less disposed to liking individual work in class without technology; however, this had a very low effect size.

How well students liked a variety of ICT tools used by faculty. Figure 1 shows that, with the exception of liking courses with online resources, means on these items (i.e., online group work, digital textbooks, and online courses) were generally low, with two items (digital textbooks and online courses) having ratings around 3 on 6-point scales. Test results show that males compared to females are more disposed to like courses that are entirely online (even though the two colleges sampled offer very few such courses), $t(241) = 2.96$, $p = .003$, as well as courses which use only digital textbooks, $t(241) = 2.95$, $p = .003$, $d = .39$.

How instructors used ICTs in their courses. Thirty-two percent of students disagreed with the statement that instructors showed them how to use ICTs needed in their courses and over 49% of students disagreed with the statement that instructors allowed them to use their personal technologies in class. The means show that males were more likely than females to indicate that their instructors allowed them to use their own ICTs in class, $t(299)=2.54$, $p=.012$, $d=.30$.

ICTs used and perceived effectiveness. Table 2 shows that most forms of ICTs used by instructors work well for students. Notable exceptions (i.e., 1/3 or more of students indicated that this did not work well for them) include: digital

textbooks; online tools (e.g., blogs); collaborative work online; online communication tools, including discussion forums, chat rooms, and instant messaging; and all forms of social networking when used by faculty to communicate (i.e., Twitter, Facebook, and LinkedIn).

Table 1. Liking courses with and without ICT use by intructors

		Mean	SD	F test	Partial Eta Squared
Use of ICT					
Instructor does not use	Female	2.93	1.61	ICT F(1,294)=287.15, p <.001	.494
	Male	2.88	1.55	Gender F(1,294)=.56, p = .456	.002
Instructor does use	Female	5.07	0.87	Interaction F(1,294)=.04, p = .840	.000
	Male	4.98	1.04		
Lecture format					
No ICT	Female	2.84	1.61	ICT F(1,300)=332.67, p <.001	.526
	Male	2.95	1.63	Gender F(1,300)=2.10, p = .148	.007
With ICT	Female	5.41	0.89	Interaction F(1,300)=3.68, p = .056	.012
	Male	5.02	1.19		
Individual work in class					
No ICT	Female	3.64	1.73	ICT F(1,295)=110.85, p <.001	.273
	Male	3.13	1.77	Gender F(1,295)=.75, p = .387	.003
With ICT	Female	4.71	1.38	Interaction F(1,295)=8.47, p =.004	.028
	Male	5.02	1.04		
Group work in class					
No ICT	Female	3.60	1.70	ICT F(1,280)=55.88, p <.001	.166
	Male	3.52	1.63	Gender F(1,280)=.064, p =.801	.000
With ICT	Female	4.47	1.47	Interaction F(1,280)=.76, p = .384	.000
	Male	4.62	1.26		

On the other hand, several forms of infrequently used ICTs (i.e., if fewer than 2/3 of students indicated their instructor used this) were identified by students as working well (i.e., by over 2/3 of students). As Table 2 shows, these include online materials such as attendance records and tests/quizzes; a variety of different ICT tools used in class (i.e., grammar tools and checkers, language learning software, simulations / virtual experiments, mind mapping, and web conferencing); hardware such as interactive whiteboards and clickers; several online tools (wikis, portfolios and podcasts), as well as virtual office hours.

Table 2 shows that the top forms of ICTs that over 90% of students indicated were being used by their instructors and that worked well for them include: online grades, course outlines, assignments and course notes; presentation software used in class; and hardware such as multimedia projectors, computers used for teaching, and computer labs. In addition, 95% of students indicated that online submission of assignment worked well for them, and 89% of instructors used this.

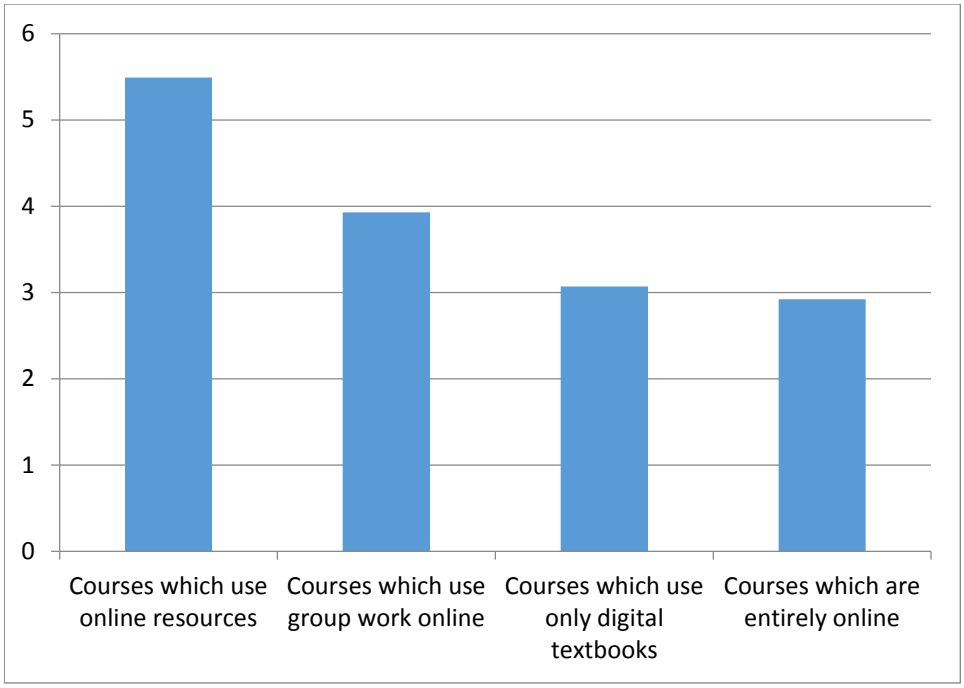

Figure 1. How well students liked ICTs used by faculty in different contexts: mean scores, higher scores indicate greater liking.

Table 2. Rank order for ICT frequency and ICTs that worked well for students

Rank order	Technology	ICT used ***	Worked well**
Online materials			
1	Grades available online	298 (98%)	294 (99%)
2	Course outline availabe online	296 (98%)	277 (96%)
3	Assignments available online	297 (96%)	286 (97%)
4	Course notes available online	271 (90%)	262 (97%)
5	Weblinks available online	251 (81%)	216 (87%)
6	Calendar available online	217 (70%)	188 (87%)
7	Tutorials / practice exercises available online	212 (69%)	176 (84%)
8	Attendance record available online	***191 (62%)***	169 (90%)
9	Tests / quizzes available online	***181 (59%)***	156 (89%)
E-learning used in class			
1	Presentation software	298 (96%)	293 (98%)
2	Grammar tools and checkers	***167 (54%)***	148 (90%)
3	Language learning software	***106 (35%)***	90 (87%)
4	Simulations / virtual experiments	***94 (31%)***	83 (89%)
5	Mind mapping	***52 (17%)***	37 (73%)
6	Web conferencing	***26 (8%)***	18 (69%)
Hardware used			
1	Multimedia projector	293 (95%)	280 (96%)
2	Computer to teach	284 (92%)	255 (91%)
3	Computer lab	279 (91%)	251 (90%)
4	Smart Board*	***95 (63%)***	73 (78%)
5	Digital textbooks available online	82 (27%)	***52 (64%)***
6	Clickers	***78 (25%)***	57 (73%)
Online tools			
1	Online submission of assignments	273 (89%)	255 (95%)
2	Videos	208 (68%)	174 (84%)
3	Style guides	200 (64%)	***35 (18%)***
4	Blogs	94 (30%)	***57 (61%)***
5	Collaborative work online	79 (25%)	***49 (62%)***
6	Wiki sites	***73 (24%)***	54 (76%)
7	Portfolios	***56 (18%)***	48 (86%)
8	Podcasts	***28 (9%)***	20 (71%)
Communication tools			
1	E-mail	261 (85%)	225 (87%)
2	Discussion forum	111 (36%)	***58 (53%)***
3	Virtual office hours	***93 (30%)***	79 (86%)
4	Chat room	66 (21%)	***39 (59%)***
5	Instant messaging	28 (9%)	***5 (46%)***
Social networking			
1	Facebook	45 (15%)	***25 (56%)***
2	Twitter	17 (6%)	***9 (56%)***
3	LinkedIn	11 (4%)	***7 (64%)***

Note. Ranking is done by percentage of students who said that the ICT was used.

*Smart Board percentages are based only on the English language college

**Bolded and italicized items: working well endorsed by fewer than 2/3 of students

***Bolded and italicized items: e-learning reportedly working well but used relatively infrequently

Table 3. Top 5 especially pleasing and annoying open-ended responses in rank order

Especially pleasing	Especially annoying
1. Presentation software: PowerPoint (e.g., to guide the class; during lectures helps keep track of what is being said; helps with note taking; helps understand the material	1. Presentation software: PowerPoint (e.g., moving quickly through slides without adequate tir spent on each topic; notes on the PowerPoint vague; to cluttered)
2. Videos (e.g., helps understanding; audio visual media helps to explain the subject of their class	2. Instructors' knowledge and use of technology (e.g., instructors spend more time trying to operate the technologies than teaching; posting links that do not wo uploading files that won't open
3. CMS course notes posted online (e.g., PowerPoint presentations posted online can be viewed later; this eliminating the need to take notes; these be used to study for exams; helps when students miss a class	3. Online communication (e.g., not responding to emails; office hours via Skype a useless - I prefer seeing my instructor in person; online chat rooms are a hassle; too many different means of communication (Facebook; email; twitter) – takers lots c time to figure out where to find messages; doing group work in an online discussion forum is difficult as no real time response from peers
4. CMS: Features (due dates; calendar; on-line practice/exercises) (e.g., practice questions and quizzes available online; calendaring feature allows keeping track of assignment due dates; instructors' office hours; course changes and announcements are available; convenience of having all documents posted online	4. CMS: Features (due dates; calendar; on-line practice/ex (e.g., materials uploaded late; having to look at multiple CMS (including instructors' own web sites) causes confusion; documents not posted online; wrong date of exam or quiz listed on the calendar
5. CMS grades posted online (e.g., seeing my grades lets me know how much more I should be focusing on specific classes; gives students a better idea of their current standing in the course; instant feedback	5. Performance of technology at school (e.g., when technologies don't work this interferes with t class: there are no sounds from the video; the video wo load; some are running very slowly; portions of the CMS don't work

Students' Experiences with ICTs Used by Faculty

*Positive and negative experiences with ICTs***.** Table 3 presents the top 5 open-ended favorable and unfavorable responses. These show that two common uses of ICTs, presentation software such as PowerPoint, and CMS/LMS features such as due dates, calendaring, and on-line practice/exercises, were used in ways that could work either well or poorly for students. Other favorable topics include videos, and posting course notes and grades online on the CMS/LMS. On the negative side, students did not appreciate their instructors' knowledge and use of ICTs or the performance of technologies at their college. In addition, they had a variety of complaints related to online communication with faculty and peers. These include: not responding to students' emails in a timely manner, not responding in a beneficial way / posting on discussion forums when the student prefers that something remain personal, hard to send large assignments on the CMS/LMS email tool, too many different means for communication (e.g., Facebook, CMS/LMS, Twitter, e-mail) resulting in students not knowing where to find responses from their instructor, too many e-mails from instructors (e.g., four per day), having to use Skype on weekends, virtual office hours with no face-to-face office hours.

Suggestions for improvement. Table 4 shows the top 10 ICT-related suggestions, along with examples, in rank order of frequency. These are detailed in a subsequent section.

Table 4. Top 10 suggestions

1. Use and availability of technology at school
   (e.g., more power outlets in class / in the library; more printers around school; better access to computer labs to work on assignments; more accessible areas for Wi-Fi for phones and tablets)
2. Instructors' knowledge and use of technology
   (e.g., make sure that all instructors have a basic understanding of how a projector works; classes should not revolve around technologies; a small 101 course for teachers who are not used to using a computer given by the college's tech support; technology should be an aid to teaching rather than replacing my instructor)
3. Presentation software: PowerPoint
   (e.g., More in class PowerPoint lectures; PowerPoint presentations that highlight key terms; interesting visual components like photos rather than just text; clearer PowerPoints; less busy; no need to use PowerPoint if slides are useless; avoid presentations were the instructor simply reads the PowerPoint)
4. Performance of technology at school
   (e.g., Better quality projectors; often problems with Wi Fi; computers in computer labs require improvement; problems with the "online classroom"; Adobe Connect did not work well; speakers did not work; the webcam was frozen; computers are very slow in labs and classrooms; better software leases; replace computers with faster ones)
5. CMS: Features (due dates; calendar; on-line practice/exercises)
   (e.g., put up online course announcements (for example notification of a project submission date approaching or exam dates); upload practice exams/questions/quizzes; upload practice quizzes that provide full explanation; practice quizzes/exercises that will tell us right away that we have a mistake and what that mistake was; use a single CMS platform by all instructors; create a calendar online; put a digital version of all documents online; post everything done in class online)
6. Allowing use of personal technology in class
   (e.g., allow students the option of using their personal technologies for note taking; smartphones can permit students to look up definitions or verify information to better contribute to the class and to improve their comprehension; allow phones to record lectures to look back on; allow personal devices to take
7. Online communication
   (e.g., use group chats where classmates can talk to each other/instructors at specific times; online office hours; online chats in real time with other students at specific times; do not use social media- not all students use this; allow emails with small questions rather than going to office hours)
8. CMS course notes posted online
   (e.g., Post PowerPoint class notes on the CMS; post notes in advance of the class)
9. Videos
   (e.g., use short videos; use videos like YouTube that are easy to access; provide more videos as illustrations; show portions of videos not the entire long thing)
10. Interactive white board: SmartBoard
    (e.g., provide more substantial course notes in SmartBoard rooms rather than just exercises and examples; more SmartBoards installed in classrooms; use SmartBoards for group exercises)

Discussion. At the outset, we must note that our data are based on students' reported experiences and perceptions, and not on grades or other objective measures of academic outcome. It is for future research to explore the impact of these on learning and performance. Of course, students may not know what is best for them in supporting their learning. That being said, while our findings cannot show that use of suggestions made by students will increase learning outcomes, these can provide an indication about what ICT-related practices

college instructors use and which of these students like and dislike in various teaching contexts. Students' views do provide an indication of what they find engaging and motivating, and what ICT-related teaching practices they feel need improvement.

Gender, field of study and evaluations of own, instructors' and the school's technology

Gender and field of study. There were no significant differences among students enrolled in English and French language colleges or among those enrolled in arts, sciences, and the social sciences. There were few significant differences on gender although all of these suggested that males liked technology more than females. For example, males rated themselves as more knowledgeable about ICTs and were more likely to prefer individual work in class with technology than females. They were also more tolerant of online courses and of digital textbooks. Thus, in attempts to engage male students, we recommend the use of ICTs in both course work and by instructors in their teaching.

Others have shown that field of study is related to preference for technology, with students in the arts preferring more limited technology than those in the physical sciences, and students in social sciences being in the middle (Kvavik, 2015). In our investigation the absence of differences among students in different fields may have been due to the fact that while almost half of both male and female students were enrolled in the social sciences, females were more likely to be enrolled in art and males in physical science related programs. The finding that instructors of male students were more likely to allow students to use their own ICTs in class than instructors of females may have been related to the larger proportion of males in science and engineering related programs. It is possible that these disciplines require students to work on their personal devices, given the shortage of computer labs in the colleges.

How well students liked courses and course components with and without ICTs. In a series of analyses on how well students liked courses and course components such as lectures, individual and group work in class, consistent with Kvavik's (2015) findings, our results clearly show that both males and females strongly and consistently preferred the use of ICTs in all contexts. That students like teaching with technologies has been shown in several recent industry sponsored studies as well (e.g., Belardi, 2015; Schaffhauser, 2015b). These results suggest that the use of ICTs by faculty is desirable.

How well students liked a variety of ICT tools used by faculty. While students liked courses with online resources, they were ambivalent toward online group work, and disliked the use of digital textbooks. They also disliked online courses, even though few of them experienced this. Digital textbooks can serve as the main text for a class, be it traditional or online. There are many advantages of digital over paper textbooks, including cost and convenience, since many are searchable, accessible to students with certain disabilities, and functional on multiple portable devices. However, there are important problems related to usability, including eye strain, multiple platforms, navigation tools, the need for

an online connection, and programmed expiration (many digital books expire and become unavailable after a pre-defined period of time) (Mann, 2013). Once students have experience with digital textbooks, however, they are more likely to use them in the future (Dennis, 2011; Weisberg, 2011). Thus, for now, we suggest that faculty offer students the option to use digital or print texts.

How instructors use ICTs in their courses. Overall, half of the respondents indicated that their instructors did not allow them to use their personal ICTs in class. Perhaps more important, 1/3 of students indicated that their instructors did not show them how to use ICTs needed in their courses. This is an important finding and suggests that instructors should not assume that all their students are tech-savvy and know how to use needed technologies. As several scholars and investigators have noted, it is important not to make assumptions about the level of ICT literacy of "digital native" college students (Burton, et al., 2015; Kvavik, 2015; Schaffhauser, 2015).

ICTs used and perceived effectiveness

*Forms of ICTs used and how well these work for students***.** Table 3 presents an extensive listing of the frequency of different forms of ICTs used by college instructors along with the percentage of students who indicated that this form of ICT worked well for them. Overall, the results show that the most popular forms of ICTs worked well for students.

The top technologies (i.e., used frequently by faculty that students indicated worked well for them) are: online grades, course outlines, assignments and course notes; online submission of assignments; presentation software used in class; hardware such as multimedia projectors; computers used for teaching; and the availability of computer labs. These are frequently used by faculty and are seen as effective by students.

On the other hand, there are several forms of ICTs that many students indicated work well, but which were relatively infrequently used by instructors: online attendance records, online tests and quizzes, and a variety of different forms of ICTs used in class, including grammar tools and checkers, language learning software, simulations and virtual experiments, mind mapping software, and web conferencing. Among online tools, wikis, portfolios and podcasts were relatively infrequently used along with virtual office hours for communication. The same was true of SmartBoards and clickers. These are ICTs that could be used more frequently by instructors.

It was encouraging to find that forms of ICTs which did not work well for students were used relatively infrequently. These include: digital textbooks, online style guides, blogs, collaborative work online, as well as a variety of online communication tools (i.e., discussion forums, chat rooms, and instant messaging), and all forms of social networking used by instructors to communicate with students (i.e., Twitter, Facebook, and LinkedIn). A propos of this latter finding, it appears that students do not wish instructors to use their social spaces.

*Positive and negative experiences with ICTs***.** Table 4 presents students' top five open-ended positive and negative responses. These show that two common uses of ICTs, presentation software such as PowerPoint, and CMS/LMS features such as due dates, the calendar, and on-line practice, were used in ways that could work either well or poorly for students, depending on the circumstances. For example, while students found that PowerPoint presentations guided the class, provided help with note taking and freed students from continually having to write, it was problematic when instructors moved thought slides too quickly and when slides were too cluttered and difficult to see. Data in Table 4 can be used to see students' examples of effective and ineffective uses of these technologies.

Students generally found that short videos helped them understand course content. They also liked having grades posted online, as this gave them an idea about their standing in the course and provided information about which courses needed extra attention. Students also liked having course notes and PowerPoints posted online because these helped them recall lecture content, facilitated studying as well as dealing with missed classes.

Students were especially displeased when their instructor tried to use ICTs but did not know how or were careless in its use. For example, students' were unhappy when their instructors wasted class time trying to figure out how to make the technology work. Additionally, students were frustrated when their instructors posted links that did not work and files that would not open. We suggest that colleges provide instruction on the use of ICTs for their faculty.

Suggestions for improvement

*Instructors' use of ICTs***.** Overall, college instructors received the equivalent of a C+ on their use of technology. Therefore it was not surprising that many of the students' suggestions for improvement relate to what changes instructors can make. We recommend that colleges offer courses and workshop for instructors – and provide both time and incentives for attendance.

For example, students wanted some of their instructors to be more tech-savvy, while others wanted instructors to use ICTs as a teaching tool rather than have technology be the focus. They also wanted their instructors to use videos to illustrate concepts, but they wanted only short videos or selected portions of longer ones. Students liked their instructors to use interactive whiteboards, such as SmartBoards, but they also wanted course notes in addition to SmartBoard exercises and examples. Moreover, students wanted their instructors to show them how to use technologies needed for the course.

*CMS/LMS***.** Students complained about having to use to use multiple CMS/LMS; this caused confusion and difficulties about needing to learn various from of CMS/LMS, about the lack of integration of course calendars and various forms of online communication.

When it comes to instructors' use of CMS/LMS we suggest that each instructor use the various features of their CMS/LMS and that colleges centralize around a single powerful, customizable CMS/LMS which is supported by a high level education technology professional.

Students wanted all instructors at their school to use the same platform because they found the use of individual web pages and different CMS/LMS confusing and burdensome. They asked that class materials, including handouts, assignments, course outlines, etc. be posted online, for instructors to use the online calendar highlighting exam and assignment due dates, as well as to post practice tests/quizzes which provide feedback.

*Online communication***.** We suggest that instructors specify their availability and their response time for email or other forms of online communication and that they stay away from the use of social media to communicate with their students.

For example, students did not like not like communicating with their instructors through social media such as Facebook and Twitter. They did want to be able to email their instructors with short questions – and they expected their instructors to respond to such emails promptly. Students also wanted synchronous chats and virtual office hours to be able to communicate with classmates and instructors at specific times in addition to – not instead of - regular office hours.

Use of personal technologies in class. Students called for their instructors to allow them to use personal technologies such as laptops, tablets and smartphones in class. Such technologies can, of course, be used for non-academic activities such as browsing Facebook, web surfing, etc. Whether to allow students to use their own technologies or not is contentious (Fischma, 2009), and studies have shown that multitasking in class results in poorer learning (Dietz & Henrich, 2014) both for the multitasker as well as for those who can see the multitasker's screen (Sana, et al., 2013). Yet students, in general, embrace the practice (Kay & Lauricella, 2014) and, in our sample only one of the 311 students indicated that allowing personal technology in class worked poorly for them. On the academic side, students needed these devices to take lecture notes, look up definitions, and verify information before raising their hand in class. They also wanted to be allowed to record lectures.

We suggest that instructors allow the use of personal technologies in class with a few caveats. Specifically, we would like to see instructors inform their students about poorer learning – and grades – of those multitasking. We also suggest that instructors designate specific areas of the classroom for those using their own technologies – this will prevent others from being distracted by what is going on students' screens.

PowerPoint. The use of PowerPoint was virtually ubiquitous and students had a variety of things to say about what they wanted. We suggest that faculty use PowerPoint in their courses and that they post these before the class. We also suggest that colleges provide instruction on the effective use of PowerPoint (e.g.,

no more than seven words per line and seven lines per slide, avoid flashy elements that do not add information, insert alternative text on images and graphs, discuss the points rather than merely reading these).

Students wanted PowerPoint and other course notes to be available online, preferably before the class. In regard to in-class presentations, they asked for presentations with interesting visual components - not merely text. They also wanted presentations that were not busy and which highlighted key terms. Students also expected instructors to not merely read the points on a presentation, but to discuss these.

School equipment. Colleges need to pay more attention to the digital equipment available to their students. This means up-to-date equipment in labs, more work stations in labs, better Wi-Fi connectivity and more AC power outlets.

Students wanted ICTs to work better in their colleges. For example, they requested higher quality projectors, faster computers in computer labs, and generally better tech functionality (e.g., speakers that work, webcams that do not freeze, more site licenses). Students also wanted greater access to computer labs to work on assignments, more AC power outlets so they could charge their personal devices, and better Wi-Fi functionality.

Limitations and future research. Our findings are based on volunteer students' views and perceptions from only two colleges. In future, the views of larger samples of students enrolled in different disciplines should be studied. In addition, the effects of different uses of technology in diverse contexts on learning and performance should be evaluated.

Students' recommendations and "take-homes" for colleges and instructors. Many of the recommendations that follow are a direct response to the students' suggestions for improvement discussed earlier. Therefore, these suggestions are not merely what we feel instructors should do. These reflect what students say they really want.

Advice for instructors. Do use technology in your teaching. However, if you are not sure about how to do something, ask a colleague or sign up for a workshop or webinar. Make sure that equipment and software works before each class. If the equipment does not work, don't spend time trying to fix it –instead continue with the class. Make certain that PowerPoint presentations are clear and uncluttered. A good guideline to apply is seven words across and seven lines for each slide. Do use videos but keep these short. If you use an interactive whiteboard, such as a SmartBoard, do not forget to incorporate conventional techniques, such as PowerPoints of course notes.

Don't assume that all your students know how to use course related ICTs such as Excel, online portfolios, and Google Drive. Show them how to do this.

As many students do not appreciate these, reassess your use of online style guides, blogs, online collaborative work, as well as a variety of online communication tools (i.e., discussion forums, chat rooms, and instant messaging). Students indicate that they are not yet comfortable with these forms of communication. If you prefer to use a digital textbook, make sure there are adequate paper versions available as well.

Post all material online and use the various features of you CMS/LMS such as online calendaring, gradebooks, and attendance records as well as online practice tests and quizzes (which provide the correct answers). Check to make sure that posted hyperlinks work and that files open. Post your course notes/PowerPoints online. If you are concerned about intellectual property, you can address this by using the free, easy-to-use Creative Commons license to copyright your materials <https://creativecommons.org/about>.

Avoid using social media such as Facebook and Twitter for communication with your students. Instead, respond to emails and set up virtual office hours/synchronized group chats (in addition to regular face-to-face office hours).

Students want to use their own ICTs in class, even though the literature clearly shows that doing so interferes with learning. You may want to inform students about the negative impact of multitasking on learning and designate a specific area of the classroom for students who want to use their own technology so that its use does not interfere with others' learning.

We agree that Wi-Fi dead zones and power outlets are the responsibility of the college. But to speed things up and improve education for your students you may want to work in collaboration with the IT department and query your students about the college Wi-Fi dead spots. You can then report a collection of these to your IT department. As for addressing the issue of inadequate power outlets, we suggest that a low cost alternative is installing a power bar in classrooms. If the college is unable to provide these, consider that maybe you, as the instructor, can!

Advice for colleges. Address ways by which you can more readily find and fix Wi-Fi dead zones. Maybe you can enlist the help of faculty with this, since they have ongoing contact with students. Think about using power bars (obviously in a manner that takes safety into account) to deal with the problem of inadequate power outlets in classrooms and the library. Take leadership to have the college centralize around a single CMS/LMS and provide webinars and workshops to help faculty with its use. Whenever budgets allow, upgrade equipment that is obsolete, develop a system that makes it easy for students and faculty to report problem with hardware and software, and provide the best possible access to computer labs so students can work on assignments.

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