ASSETT CU-Boulder Faculty Teaching with Technology Report

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March 8, 2016

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A. Project Background

The ASSETT (Arts and Sciences Support of Education Through Technology) group provides pedagogical and academic technology support services for the College of Arts and Sciences at CU-Boulder, and is supported by an A&S student fee per credit hour. ASSETT initiated a large Needs Assessment project in 2015. The project aimed to describe the needs of A&S faculty and undergraduate students for services around teaching and learning with technology. These reports will inform the development of those services by ASSETT and be shared with other campus groups.

The first phase of this project involved holding interviews and focus groups with ASSETT stakeholders and CU-Boulder students. We then compiled existing information about teaching and learning with technology from campus and published outside sources, which together informed the development of a pair of campus-wide surveys. The first survey, for undergraduate students, focused on learning with technology. The second survey, for faculty and graduate students, focused on teaching with technology. For the faculty survey, ideas were also contributed by the Boulder Faculty Assembly Administrative Services and Technology Committee (BFA-AST), chaired by Paul Voakes, and Mark Werner, Director of the Academic Technology and Design Team (ATDT) in the Office of Information Technology (OIT).

B. Methods

Survey Development

Previous ASSETT Needs Assessments were conducted in 2008 and 2011. These assessments focused on faculty, staff, and student technology needs and user experiences. The focus of this project differed from previous ASSETT Needs Assessments with a greater emphasis on the intersection of teaching, learning and pedagogy. Items were also constructed to assess areas in which respondents desired to learn more or change, to directly inform the direction of our services.

Most items were constructed de novo or modified from previous ASSETT or OIT technology surveys. One item related to the preparation of students to use technology was taken from the ECAR "Study of Undergraduate Students and Information Technology" (Dahlstrom and Bischel, 2014). Items were formatted to allow greatest accessibility, including mobile device use. Question subitems were randomized when possible.

Recruitment and Response

All CU-Boulder faculty and graduate students were invited to participate in the "CU Teaching With Technology Survey" (n = 7729). Deans and Assistant Deans of Libraries, Engineering, CMCI, Education, and all three divisions of Arts and Sciences, along with UGGS and the BFA, promoted the survey via a Qualtrics email invitation and two reminders. Participation was incentivized with a raffle of eight $100 gift cards.

Response exceeded expectations. Of those contacted, 1,945 individuals (25%) began the survey, though 29% of these reported they had not taught undergraduates in the past few years, and were routed out of the survey. 1,380 participants continued the survey, of which 1,224 (89%) completed it. The average time it took individuals to complete the full survey was 12 minutes. Some participants (n = 58) indicated low interest in integrating technology into their courses. The survey routed these individuals to a much shorter subset of questions.

Response rates of the faculty and graduate student populations differed. Of CU-Boulder faculty and instructors contacted (n = 2396), 26% responded to and completed the survey. Of CU-Boulder graduate students contacted (n = 5333), 11% completed the survey, but many graduate students do not teach. According to Institutional Research data, 1,298 or approximately 25% of all graduate students had TA or GPTI appointments in 2014 (http://www.colorado.edu/pba/facstaff/fac20147.htm). 601 TAs and GPTIs completed this survey, so the maximum response rate of TAs and GPTIs based on those Institutional Research numbers is 46%.

Data were anonymized immediately upon survey close, with raffle participant emails saved on an external drive for confidentiality. Surveys that were at least 80% complete were retained for analysis (n = 1,224). Qualtrics raw data and tables were exported separately and formatted in Excel.

This report focuses on the results from A&S faculty, instructors, adjuncts and GPTI (Graduate Part Time Instructor) participants (n = 473), who reported having taught undergraduates in the last few years, and reported having a neutral to strong interest in incorporating technology into their teaching. Below, this subset of participants is referred to as "faculty" or "A&S faculty". The population of respondents is skewed toward females (Table 13) and to faculty who are strongly interested in incorporating technology into their courses (Table 2).

Within each section of this report, results from A&S faculty are compared with those of A&S undergraduates and non A&S faculty, where major differences were found. In Section J, comparisons are made between A&S faculty, lower tech interest faculty, and graduate student TAs. Tables of quantitative results for these subpopulations are archived separately at https://assett.colorado.edu/assessment/reports, along with the reports of our 2015 "Student Learning with Technology" survey of undergraduates.

C. Results

a. Faculty Teaching Position

Table 1. What is the best description of your teaching position? (n = 473)

A&S Faculty / Instructor	67%
GPTI (Graduate Part Time Instructor)	20%
Adjunct Faculty / Other	13%

b. Faculty Perceptions of Undergraduate Digital Skills

The majority of A&S faculty respondents perceive undergraduates at CU to be adequately prepared to use technology in their courses, though 27% neither agreed nor disagreed with this item (Table 2). Two-thirds reported that on the whole, undergraduates communicate professionally with them. They think students have moderate skills in producing digital presentations and online content.

Faculty perceive undergraduates to be less proficient with digital literacy skills. One-third think their students do not find or organize digital information very well. The majority (52%) think they lack skill in validating digital information. Validating information is the top skill faculty report wanting students to develop, along with better finding digital information and communicating professionally (Table 3).

In comparison, A&S undergraduates reported more favorable impressions of their own digital literacy, with over 80% of students rating themselves as fairly to very skilled in finding, organizing, and vetting digital information. Students and faculty agreed, however, that learning to organize digital information is a high priority. Faculty outside A&S rated their students slightly higher in creating digital content, but lower in finding digital information and keeping it organized, compared to A&S faculty.

c. Preferences for Course Types

Over 80% of faculty very much prefer to teach traditional courses, defined here as meeting all sessions face-to-face (perhaps with some online components). Other top preferences for course types are course-based research / independent study and the "flipped" model, in which students prepare online outside of class and then engage in discussion or activities face-to-face (Table 4). Faculty outside A&S showed relatively more interest in project-based courses.

Faculty do not prefer to teach online (57%) or in a hybrid format (where some sessions occur online, 32%). One-third of faculty reported no experience with these least popular course types (Table 4).

Table 2. To what extent do you agree that… (n = 473) Those disagreeing to the first statement were filtered out for this report (N/A; n = 26 A&S faculty, n = 58 of all respondents).

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree
I am very interested in incorporating technologies into my courses that make teaching more effective or efficient	49%	39%	11%	N/A	N/A
undergraduates entering CU are adequately prepared to use technology to complete coursework	12%	43%	27%	15%	3%

Table 3. How skilled are your undergraduates with these activities? What are the Top 2 skills you wish students could better develop? (n = 434)

	Top 2 for students to develop	Very well	sort of well	not very well	N/A: no experience
validating the accuracy of digital information	44%	11%	23%	52%	13%
finding digital information (via library, journal websites, etc.)	41%	20%	39%	35%	6%
communicating professionally via email, online discussion, video calls (Skype, Zoom, Facetime, etc.)	32%	24%	41%	31%	4%
creating digital and web content (making a website, using a wiki, blogging, making a Powerpoint presentation, making a poster)	13%	14%	38%	16%	32%
keeping digital information organized	11%	8%	36%	30%	26%

Table 4. What are your preferences for teaching these kinds of undergraduate courses? (n = 473)

	very preferred	somewhat preferred	not preferred	N/A: no experience
typical face to face (core instruction happens in class, may also have online readings or assignments)	81%	17%	2%	0%
course-based research / independent study	24%	41%	13%	22%
flipped (students prepare for class online, allowing time for discussion/ activities in class)	22%	39%	15%	23%
project-based (including service learning, internship / practicum, performance)	21%	35%	13%	30%
laboratory	15%	18%	10%	58%
hybrid / blended (1/3 or more class sessions are online, the rest are face to face)	10%	27%	32%	32%
completely online	3%	10%	57%	31%

d. Use and Interest in Academic Technologies

We divided academic technologies into 26 categories and asked faculty to report how often they use them in class, and which they are interested in learning about or using more. These were grouped with three question blocks grouping tools used in-class, specifically for assignments, or online (Tables 5-7). Within each question block we described the function of several categories of tools and gave several typical examples currently being used by faculty at CU. Parallel questions were asked during our 2015 "Student Learning With Technology" survey.

In-class Tools

Results about tools used for teaching preparation and during class are presented in Table 5. Several non-digital teaching aids are listed along with a variety of academic technologies. The most widely used aids are Powerpoint and the board. Nearly 80% of faculty reported using online sources for finding curricula, and nearly two-thirds use in-class activities (aka "active learning") in some or all courses. Nearly half of faculty use a document camera or overhead projector. The majority of faculty (52%) have not used iClickers (aka "personal response systems"). Only a small fraction of faculty (5-15%) have abandoned each of these technologies after trying them (Table 5).

Although two-thirds of faculty reported never having tried using an in-class discussion technology (like Twitter, Padlet, or TodaysMeet), this is their "Top Pick" to learn or use more in the future, along with in-class activity tools (Table 5). In comparison to A&S faculty, relatively more faculty outside A&S do not use Powerpoint, use curricula found online, and use in-class activities in most of their courses.

Table 5. Do you use these in-class technologies for teaching undergraduates? Which are the Top 3 in-class technologies you would like to learn or use more? (n = 442)

	Top 3	use in most of my classes	have used in some classes	tried, but do not use	N/A: no experience
in-class activities, problems (via worksheets, tablets, laptops, simulations, beSocratic, etc.)	52%	33%	30%	6%	30%
in-class question, discussion tools (e.g. Twitter, TodaysMeet, aka "backchannel communication")	47%	8%	13%	11%	68%
using online resources to find high quality curricular materials	37%	48%	31%	3%	18%
iClickers	24%	23%	16%	9%	52%
other presentation tool (Prezi, Google presentation, Slide Carnival, etc.)	23%	14%	21%	15%	51%
whiteboard / blackboard	20%	58%	23%	6%	14%
Powerpoint or Keynote	20%	74%	16%	4%	5%
document camera / overhead projector	15%	28%	20%	14%	38%

Assignment-specific digital tools

Results about tools typically used for the completion of assignments out of class are presented in Table 6. The most widely used tools are online readings and tools typically used by individuals to complete projects, such as Powerpoint and D2L assignment submission. Nearly half of faculty assign students practice problems or quizzes online and they are very interested in developing quizzes with instant feedback. In our companion undergraduate study, quizzes with instant feedback was the students' "Top Pick" of the assignment tools. Although Chinook and other computer-based research tools are widely used by students and faculty, a quarter of faculty have never assigned students to use such a tool (Table 6).

Over half of faculty ask students to engage in online discussions, and about a third of faculty are strongly interested in learning about or using them more. However, in our companion study, 32% of CU undergraduates described online discussions as "not helpful", making this their least preferred online learning tool, and 15% of faculty no longer use online discussions, which is the highest rate of abandonment of any academic technology we surveyed about (Table 6).

While the majority of faculty do not currently assign students to use collaborative tools, such as Google Apps for Edu, VoiceThread, and NB (NotaBene), these are "Top Picks" for both student

Table 6. Do you have undergraduates use these assignment technology tools? Which are your Top 3 assignment technology tools to learn about or use more? (n = 432)

	Top 3	use in most of my classes	have used in some classes	tried, but do not use	N/A: no experience using
collaborative reading and discussion tools (e.g. VoiceThread, NB, NotaBene, Highlighter, beSocratic)	43%	3%	10%	10%	77%
collaborative project, writing, editing tools (wikis, PBWorks, Weebly, Google Drive, Dropbox, Zotero)	38%	16%	29%	12%	43%
online practice problems / quizzes with instant feedback	36%	22%	22%	8%	47%
online discussions (D2L, Today's Meet, etc)	31%	33%	21%	15%	30%
individual written assignment, presentation and project tools (blogs, assignment submission, Powerpoint, Prezi, Adobe Creative Suite, etc.)	31%	43%	28%	7%	22%
research tools (Chinook, pubMed, Google Scholar, Mendeley, Zotero, Evernote)	30%	33%	32%	8%	27%
online practice (problems, quizzes, simulations, games, CAPA, Pearson Mastering, etc.)	27%	20%	21%	7%	52%
data analysis tools (SPSS, R, Latex, Excel, NVivo, MATLAB, etc.)	24%	9%	23%	6%	62%
readings (online textbooks, articles, e-books)	21%	68%	23%	1%	8%

and faculty to learn about or use more (Table 6). Relatively more faculty outside A&S tend to use collaborative assignment tools.

Additional online academic technologies

In Table 7, information is presented about faculty use and interest in additional online tools, including D2L and other learning management systems. The D2L platform is used by 90% of faculty, while alternative platforms such as Moodle are used by 21%. Nearly half of faculty use D2L as a portal to other online tools like external homework and videos (Table 7).

Many faculty are using videos to enhance learning, either found within external sources (76%) or produced specifically for their course through Camtasia, Lecture Capture, or another tool (35%). Producing and using their own videos is the faculty's Top Pick of this question block to learn or do more (Table 7).

Relative to A&S faculty, more non A&S faculty use alternative learning management systems (31% vs. 21%), with chat to conduct office hours with students more frequently used by non A&S faculty (39% vs 13%), and more direct students to online tutorials and trainings (34% vs. 20%). In our parallel survey, we found that CU undergraduates are not strongly interested in faculty using chat tools or online trainings.

e. Digital Distraction

Concerns and Policies

Faculty voiced concerns about student digital distraction in focus groups, leading us to ask both faculty and students to report digital distraction policies that they use or would support faculty using. We also asked faculty to provide additional comments about the phenomenon and how they enforce their policies. Here, we define digital distraction as the off-task use of digital devices during class. In-class phone and laptop use has been correlated with lower course performance (Duncan et al. 2012, Aguilar-Roca et al. 2012, Ravizza et al. 2014).

Faculty survey free responses reflect widespread concern over digital distraction. One related that "I find digital distraction (through wireless-enabled laptops and smartphones) to be the single biggest challenge to teaching to have emerged in the last five years." About 20% of faculty participants reported being unsure what to do about digital distraction in class (Table 8); comments related to this point included "I just ignore it – I am torn" and "Could use help in this area - the phones seriously impede their learning". A minority of comments indicated some faculty have resolved the problem or are not concerned about it, such as:

> *"I haven't found it difficult to ask students not to use digital devices even in larger classes. They understand the reasons for doing so and co-operate."*

Table 7. Do you use any of these online tools in your teaching? Which are the Top 3 online tools you would like to learn about or use more? (n = 437)

	Top 3	use in most of my classes	have used in some classes	tried, but do not use	N/A: no experience using
videos/animations produced for my course (online lectures, Lecture Capture, Camtasia, Vimeo)	38%	14%	21%	11%	54%
chat-based office hours or meetings (D2L chat, Google Hangouts, texting, tutoring portals, etc.)	36%	4%	9%	10%	76%
simulations, PhET, educational games	27%	7%	17%	6%	70%
videoconferencing-based office hours or meetings (Zoom, Skype, Continuing Education's Composition hub, etc.)	26%	4%	13%	11%	72%
alternative to D2L (moodle, Google Site, wordpress course website)	23%	11%	10%	13%	66%
D2L course platform	23%	81%	7%	4%	8%
online tutorials and trainings (OIT tutorials, Lynda.com videos)	21%	4%	16%	13%	68%
D2L as a portal to other learning tools (homework websites, videos, simulations, Nota Bene/NB, Voice Thread, etc.)	21%	28%	18%	11%	42%
videos/animations produced elsewhere	19%	40%	36%	2%	22%

Table 8. What do you think and do about undergraduates being distracted by digital devices (or distracting others) in small classes and in large classes? (n = 265) Participants checked all that applied.

	Large Classes	Small Classes
discuss why it is a problem / how it impacts learning	57%	59%
limit or ban phones in class	45%	52%
do nothing, leave choices up to individual students	39%	32%
I am unsure what to do about this	30%	27%
limit or ban laptops / tablets in class	29%	31%
enforce the device use policy of the class (points off, call out policy-breakers, ask students to move to a zone)	27%	30%
make a device seating zone (for laptop and phone users)	15%	5%
have students vote on a digital device policy	6%	7%

In both large and small classes, the most common responses faculty make to digital distraction are to discuss why it is a problem and to limit or ban phones in class. Faculty use a number of reasons to dissuade students from off-task device use, such as:

> *"For larger classes, I emphasize that attendance is not required and that explicitly state that if students are going to use their laptops for activities not relevant to the course, they might as well watch the recording of the class at a more convenient time."*

> *"In a friendly way, I point out that students are distracting others with laptop use"*

> *"I let undergrads bring laptops to class if they sign a pledge to disable the internet while in class. I also explain to them research about digital distraction and about better learning happening when you handwrite your notes than when you type them."*

About 30% reported taking no action to curb usage (Table 8). A handful expressed a desire for the university to develop guidelines for faculty and students. Some faculty have stopped trying to curb use; statements of frustration included:

> *"My students constantly check their phones, even though I ask them not to. I have tried everything -- policy, personal request, etc."*

> *"I have tried a device seating zone, but with limited success. Sometimes students just don't sit there and I spend more time playing usher in the class than actually teaching."*

In our companion study, CU Boulder undergraduates also reported diverse perspectives on, or establish a device zone (51%). For both class sizes, students generally supported discussing the problem (>38%). A substantial fraction of students preferred faculty to ban phones, more so in

small classes (45%), but students did not prefer that policies be enforced in any size class (>75% against enforcement).

Distraction Policy Enforcement

While many faculty reported using policies or trying to establish classroom norms curbing digital distraction, only a minority (30%) reported they enforce a digital distraction policy. We catalogued which methods of enforcement faculty described using, as well as other solutions they found, from their responses to the free response question (n = 157). They most frequently reported asking students to stop using a distracting device (n = 43), with most of these reporting they do this publicly rather than doing so quietly or privately. Participation grade penalties were also frequently reported (n = 18), as well as asking violators to leave the classroom or move to a designated zone (n = 13). Several faculty wished it were possible to block wi-fi signals in classrooms in order to make policies easy to enforce.

A number of other solutions to digital distraction were also related. Several faculty described methods by which they leveraged peer pressure for enforcement, for example:

> *"If a student is goofing off on their computer or mobile device, all I have to do is get quiet and look at them with an expression of mock patience. Everyone else usually joins in, until the "offender" realizes we're all looking at them, which makes them stop whatever they were doing. In other words, I harness the power of peer pressure."*

Several others described holding distracted students accountable for engaging appropriately:

> *"I walk through the aisles during class discussion time and make a point to visit the people using a laptop and ask them about the topic of discussion"*

Quite a number of other faculty (n = 18) reported putting the onus on themselves to plan engaging and busy class sessions to preclude distraction, for example:

> *"If my students are more interested in their laptops than my course material, I need to make my curriculum more interesting."*

> *I have not found this to be a problem. When the teaching and learning are both engaged/engaging, device problems tend to disappear."*

Lastly, several faculty described the dilemma of needing students to use devices to benefit learning in class, while wanting to discourage distraction. One faculty uses this method for engaging students in addressing this dilemma:

> *"I teach students how to use body language and close their screens partially, to signal to profs that they are not distracted."*

f. Teaching Challenges and Technology Needs

To get a sense of the interaction between teaching and technology needs, we included a free response question asking participants to describe the teaching techniques and approaches they

are most interested in, beyond technology. We also asked faculty to comment on their technology needs, and to describe barriers to their implementation of technology. Comments on these three questions were quite overlapping and so were coded together under two major themes of teaching challenges and technology needs; about 100 comments from each question were coded, as this number produced clear categories within each theme.

With respect to teaching challenges, faculty comments reflected a strong desire to know more about teaching students critical thinking (n = 32) and writing skills (n = 11), and how to motivate students to do advance preparation (n = 19) and engage in class (n = 62). For example, one wrote that they were interested in "keeping my teaching engaging while being informative in a very deep and sophisticated level". Comments related to needing support for their teaching were numerous (n = 30) and included desires for their own training, such as "easily accessible and easy to follow training, hands on courses" and for training their students, such as "Learning Assistants to help students work with technologies".

Other themes related to teaching needs included finding specific information (for example, discipline-specific activities and technologies) and wanting to know more evidence that specific technologies are beneficial. A smaller category of needs related to desires to foster teaching cultures in their department and the university reward structure for teaching (n= 10).

To support their teaching with technology, many faculty expressed needs for funding software licenses and computer hardware (n = 66). The most frequently requested classroom equipment types were document cameras, tablets, and adaptors to connect computers to projectors (7 mentions each). An equal number of faculty requested that all classrooms be equipped with the same projection and Clicker equipment. Several faculty requested dual projectors, so documents and presentations could be projected independently, and several others requested lecture capture be more widely available.

Specific online and software needs were very diverse, but two strong requests were to replace D2L (n = 22) and to provide a variety of Adobe software products (n = 11). Several requests were made each for Piazza, Google Classroom, and support for secure online exams and updated online homework programs.

The most common complaint related to students and technology was their lack of common technological skills, including D2L and Google, and needing to take time to teach these skills in class (n = 14). Two commented that digital skills in today's students were lower than in their students 10 years ago.

g. Preferences for Teaching Professional Development

As ASSETT's Teaching and Learning Team provides a variety of teaching professional development services, from consultations to faculty learning communities, we asked faculty which types are the most effective for their learning. Faculty most prefer to interact one-on-one with a teaching expert, either on-call or by appointment. However, more than half indicated hour-long workshops are effective for them. Other opportunities such as intensive course redesign support, faculty learning communities, grant opportunities and several-hour workshops garnered about the same interest from faculty. Multiple-day institutes were preferred by only 6% of faculty, however (Table 9).

Table 9. Which of the following are the most effective types of learning opportunities about teaching, for you? Chose your Top 2-3. (n = 473)

	Count	Percentage
meeting 1:1 with an expert	296	63%
hour-long workshop	240	51%
contact an expert on-call (phone, email, etc)	155	33%
faculty learning community (meeting across a semester, e.g. ASSETT's Hybrid/Online Course Design Seminar)	116	25%
expert hands-on support for course redesign (e.g. OIT's Academic Design Team)	114	24%
opportunity to apply for grant funding with expert support, for a project I design (e.g. ASSETT's Development Awards)	97	21%
half-day or day-long workshop	98	21%
other	40	8%
multi-day retreats / institutes	30	6%

Faculty indicated that the best times for them to attend teaching professional developments across the year are before and early semester, and summer. They were split among all options for meeting across one week, but preferred afternoon sessions to mornings. Only 8% of respondents (n = 40) indicated they would not likely attend any professional development session (Table 10).

Table 10. When are you most likely to attend a faculty learning opportunity about teaching? (n = 439)

Time of Day/Week	
afternoons	53%
mornings	36%
mid-week (W/Th)	33%
early in week (M/T)	32%
Fridays	32%

Time of Semester	
right before semester	42%
early semester	38%
summer	37%
right after semester	14%
mid semester	10%
I am unlikely to attend one	8%

We also inquired about A&S faculty use of and satisfaction with ASSETT services. One-quarter of A&S respondents to this survey reported having consulted one-on-one with ASSETT staff. Based on the number responding to this survey item, 45% of the A&S faculty respondents had interacted with ASSETT (n=170), and free responses from quite a few others indicated that taking the survey raised their awareness and likelihood of using ASSETT. The ASSETT resources faculty indicated they are most likely to use in the future are staff consultations, faculty seminars, workshops, and website resources. For all ASSETT services, more faculty reported being very satisfied than moderately satisfied, and very few indicated dissatisfaction (Table 11).

Table 11. Please tell us about your satisfaction with your experiences in ASSETT. If you have interacted with us at ASSETT, please tell us how you may use us in the future. (n = 377)

	Number Likely to Use	I have been very satisfied with this resource	This resource is OK	I have been dissatisfied with this resource	N/A: have not used
Staff consultation (Grant, Jacie, Amanda, Nisha)	89	19%	5%	1%	75%
Faculty Seminars (Teaching with Technology, Hybrid and Online Course Design)	82	17%	10%	2%	71%
Workshops, Innovation Pit Stops, Symposia	60	12%	7%	2%	79%
Resources on ASSETT website (e.g. large course survivor series)	60	7%	8%	2%	84%
Development Awards	56	10%	2%	1%	87%
Teaching Technology Assistant (TTA) support	46	8%	3%	1%	89%
Custom Applications (e.g. Places, Readify / OCR, Syllabus Library)	26	3%	1%	1%	96%

h. Subpopulation Comparisons

The data displayed in this report summarizes the responses of A&S faculty, instructors, and GPTIs who expressed a neutral to high interest in integrating technology in their teaching. Their perspectives can be compared to graduate teaching assistants (TAs; n = 457). They can also be compared to faculty who expressed low levels of interest in teaching with technology (n = 58). Salient similarities and differences are described here; quantitative results from these populations can be found at https://assett.colorado.edu/assessment/reports/.

Teaching Assistants

Graduate student teaching assistants largely mirrored A&S faculty in their opinions about, use of, and interest in teaching with technology. A&S TAs (n=268) reported more interest than A&S faculty in learning how to teach with data analysis tools such as SPSS and R. While faculty are quite interested in using D2L as a portal to direct students to other tools like VoiceThread, this was the lowest priority for TAs to learn about. Fewer TAs than faculty use Powerpoint presentations, videos, and animations in their teaching or assignments. However, like the faculty, learning to make videos for their own courses was identified as a high priority by TAs. Like faculty, TAs are interested in teaching workshops and consultations, but relatively more (34%) are willing to devote a half-day to professional development.

Faculty with low interest in using academic technologies

The very few faculty and graduate student participants (n = 58, 5%) that responded "disagree" or "strongly disagree" to the statement *"I am very interested in incorporating technologies into my courses that make teaching more effective or efficient"* were directed to an abridged survey. They received several introductory and demographic questions, but did not receive questions about digital distraction or professional development. They responded to a subset of only 3-5 items within each academic technology tool question.

Of these faculty, 77% responded "disagree" and 23% responded "strongly disagree" to the technology interest statement. Very few of these faculty thought undergraduates were adequately skilled in finding digital information, validating its accuracy, communicating professionally, or creating digital and Web content.

Sixteen of these participants responded to a free response question asking about their technology needs. Only two responded with addressable need, both related to using D2L. All others commented that they do not need additional technology or would like to see more support of face-to-face interaction rather than technology. In one respondent's view,

"Technology and real learning are inversely proportional. Students today cannot read, or write, or think, and technologies are responsible for that to a great extent. To faculty, technologies are simply an onerous obligation. Hire more staff, and let us live happily, free from technology."

In comparison to the balance of A&S respondents, very few of these faculty use Clickers, D2L as a portal to other learning tools, or videos in their courses. Most of these respondents did not select any in-class, assignment, or online technologies or other teaching aids that they would be interested in learning more about.

i. Additional Demographics

Every A&S department on campus except one was represented, with more than 20 individuals responding from each of the departments of English, EBIO, Writing & Rhetoric, Math, Integrative Physiology, Sociology, and Political Science (Table 12). Responding A&S faculty were skewed towards females, compared to overall CU-Boulder gender ratios (Table 13; CDS database, http://www.colorado.edu/pba/cds/cds16/index.htm). Participants had an average of 8.5 years of teaching experience (Figure 1).

Table 12. Which is your primary Arts & Sciences department? (n = 473)

Answer	Number	%	Answer	Number	%	Answer	Number	%
ENGL	32	7%	HIST	14	3%	ATOC	7	1%
EBIO	27	6%	FRIT	15	3%	ENVS	5	1%
PWR	27	6%	ANTH	12	3%	HONR	4	1%
MATH	23	5%	ALC	12	3%	WGST	2	0%
ECON	18	4%	AAH	12	3%	JWST	1	0%
IPHY	21	4%	CLAS	9	2%	IAFS	1	0%
CHEM	17	4%	LING	9	2%	FILM	1	0%
SOCY	21	4%	PHIL	8	2%	APPM	1	0%
SPAN	18	4%	GSLL	9	2%	HUMN	2	0%
PSCI	20	4%	GEOL	9	2%	CLGP	0	0%
PSYC	17	4%	RLST	3	1%	Other	16	3%
THDN	14	3%	SLHS	6	1%	No answer	4	1%
PHYS	16	3%	RAP	3	1%	Total	473	100%
MCDB	13	3%	ETHN	5	1%			
GEOG	12	3%	APS	7	1%			

Table 13. What is your gender? (n = 473)

Female	55%
Male	45%

D. Discussion

Student digital skills

Compared to a national study of faculty experiences with technology (Dahlstrom and Brooks, 2014), A&S faculty in this study reported slightly less agreement (55% vs 67%) with the idea that students are adequately prepared to use technology upon entrance. The ECAR study also documented that faculty think students should be better prepared to use institutionally specific tools and basic applications, which we found frequently reflected in faculty comments. An area which the national study did not investigate was digital literacy skills; our faculty highlighted validating accuracy of information as one key concern. CU-Boulder librarians have been focused on digital literacy skill development and have developed a number of resources in this area (Beaver et al., 2014). This could be an area of focus for entering students at CU-Boulder.

Academic Technologies

It was notable that faculty preferences generally follow a pattern of familiarity, where faculty are not as interested in learning more about tools they haven't used, or course types they haven't taught. However, faculty do not tend to abandon an academic technology once they have tried it. So, once familiarized, we can assume that most faculty find new technology to be of some value. This indicates that professional development focused around technologies faculty have identified as priorities to use in the future will likely prove fruitful. Faculty top

priorities are technologies that support in-class student engagement in discussion, questioning, and activities; collaborative assignment tools and homework options with instant feedback; and producing videos for their courses.

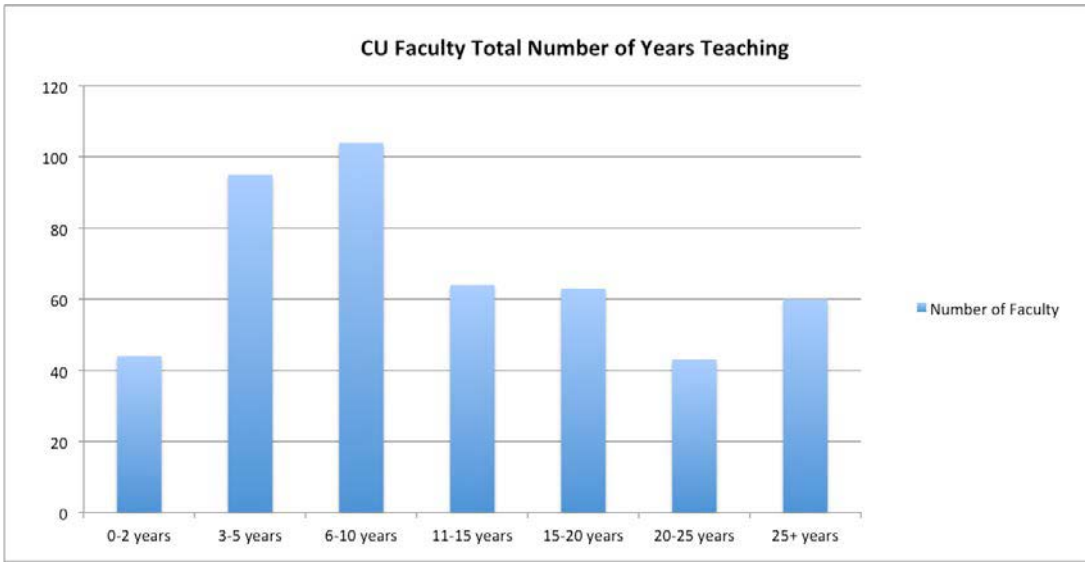

Figure 1. Frequency of number of years of teaching experience reported by A&S faculty participants. (n = 473)

Although faculty are generally interested in technologies that boost student engagement and discussion, more than 50% have never used Clickers, which are an effective means to accomplish this goal. We speculate that this results from the perception that clickers are not appropriate for use in smaller classes, or for particular disciplines, or that they cannot be used to ask sophisticated questions. However, examples of such use exist on campus (e.g. Su and Smith, 2011, Mollborn and Hoekstra 2010). It could also be due to historically fewer teaching professional development resources for non-STEM disciplines at CU-Boulder, as iClicker use is currently most widespread within STEM. As 37% of faculty identified iClickers as a technology they want to learn about or use more, we can expect there to be continued to demand for professional development and resources to support faculty in the use of iClickers.

There are some discrepancies between faculty and undergraduate students in their interest in these technologies. While in-class and collaborative tools garner strong interest from both groups, faculty have much more interest in exploring chat-based office hours and online discussions than students do. Professional development will need to alert faculty to these discrepancies. Further research is needed to identify chat and online discussion tools in these areas that are well designed and appealing to students.

Digital distraction

Faculty are using a wide array of approaches to address digital distraction and enforce digital distraction policies, and with a wide range of success. The most common strategies are to have policies limiting or banning phones, with follow-up enforcement including asking distracted students to put phones away. Only a small fraction of faculty, 5-15%, use device zones. From the

student perspectives we gathered, however, zones are by far the most preferable action to take in large classes. Research into laptop-free zones in large classes found that students do prefer this structure over no structure (Aguilar-Roca et al., 2010). For small classes, banning phones is the most preferred active policy for students.

Patterns in both the faculty and undergraduate surveys indicate that there is currently no campus consensus on what to do about digital distraction. Professional development services aneed to address the diversity of options and assist faculty in exchanging information to aid them in determining the best solutions for their students -- particularly for the third of faculty that are unsure about what to do.

Classroom equipment

While several faculty noted a need for more computers, computer labs, or laptop carts, by far the greatest mentions for classroom equipment called for document cameras and tablets. The removal of overhead projectors from classrooms in 2015 may have left a gap in A/V technology that resulted in these being the top equipment request.

Professional development

There are some conundrums within the results for teaching professional development. Faculty state a strong preference for individual expert consultation services, which is understandable from a convenience standpoint, but not possible to accommodate at scale. Faculty also prefer workshops lasting no more than an hour, but such experiences are known to be limited in their impact on instructional practice (Hanushek, 2006).

As faculty distinctly do not prefer multiple-day professional development experiences, the most sustained opportunities that faculty are likely to use are faculty learning communities and course redesign support, for which 25% of respondents indicated a preference. Faculty learning communities and action teams are currently the focus of two initiatives within the Center for STEM Learning, the TRESTLE project and the AAU project (Corbo et al., 2014). Cross-college faculty peer communities might be one way to leverage differing teaching expertise, as there are some technologies (for example, the use of online or chat office hours) for which non-A&S faculty exceed use of A&S faculty by a strong margin.

Faculty with low interest in using academic technologies

The proportion of "luddites" among the faculty respondents – those expressing low interest in using academic technology -- was quite small. Nevertheless, this faculty minority need support in using technologies they are expected to use, and need access to professional development opportunities that they are interested in. Based on our free response analysis, services that focus on effective teaching techniques that motivate students to prepare in advance, teach critical thinking and writing skills, and engage students actively in class will appeal broadly to faculty. Opportunities to help faculty expand their capacity in the classroom, through the use of Learning Assistants, undergraduate TAs, or students that can train their students in using classroom technologies could also be of particular benefit for this minority.

E. Acknowledgements

We would like to thank the ASSETT team for their thoughtful input at all stages of this process: Phoebe Young, Grant Matheny, Joyce Holliday, Brenda Niave, Amanda McAndrew, and Jacie Moriyama. Additionally, Paul Voakes, Mark Werner, and others on the Boulder Faculty Assembly (BFA) Administrative Services and Technology Committee provided critical guidance for the faculty survey. Staff at OIT helped secure the email lists used to recruit participants. The BFA, UGGS (United Government of Graduate Students), and the following Deans and Assistant Deans across the university allowed their names to be used in the promotion and recruitment of faculty members: Valerio Ferme, Mary Kraus, Ann Carlos, James Williams, Diane Sieber, Lorrie Shepard and Steve Jones.

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