ASSETT CU-Boulder Undergraduate Learning with Technology Report

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Photograph: Casey Cass, CU Boulder

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A. Project Background

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

The first phase of this project involved holding interviews and focus groups with ASSETT stakeholders and CU-Boulder students, and compiling existing information about teaching and learning with technology from campus and published outside sources. Results of the first project phase informed the development of a pair of campus-wide surveys. The first survey, for undergraduate students, focused on learning with technology. The second, for faculty and graduate students, focused on teaching with technology. Some questions were designed to compare faculty and undergraduate perspectives and needs.

B. Methods

Survey Development

Previous ASSETT Needs Assessments were conducted in 2008 and 2011. These assessments focused on technology needs and user experiences with technology. Items in the 2015 "ASSETT Student Learning Technology Survey" were constructed on the basis of the prior literature review, the 2011 ASSETT Needs Assessment survey, focus groups, and interviews. The focus of this survey differed from previous ASSETT Needs Assessments with a greater emphasis on the intersection of technology and learning, and more emphasis on future interests in addition to current usage.

Most items were constructed de novo or modified from previous ASSETT surveys. Two questions related to student preparation to use technology and relationship between technology and feelings of connection were used from the ECAR "Study of Undergraduate Students and Information Technology" (Dahlstrom and Bischel, 2014). Item formatting was designed to maximize accessibility and mobile device use. Question subitems were randomized when possible.

The undergraduate survey was administered via the Qualtrics survey tool in October 2015. An initial invitation and two reminders with individual survey links were emailed to a random sample of 20% of the undergraduate student body (n = 6,961) via Qualtrics. Participation was incentivized with a raffle of eight $25 gift cards. Responses were gathered from 11% of the random sample (n = 746).

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 = 470). Qualtrics raw data and tables were exported, formatted, and compared between Arts & Sciences and non-Arts & Sciences respondents, to reveal any A&S-specific trends. Narrative descriptions and tables of Arts & Sciences undergraduate results from all questions follow. This population is referred to below as "A&S undergraduates", "A&S students", or "students". Where distinct differences were found with the non-Arts & Sciences undergraduate population, they are described. Tables of results from all undergraduates, as well as other subpopulations, are found at:
https://assett.colorado.edu/assessment/reports/

C. Results

a. Preferences for Course Types

A&S undergraduates indicated a strong preference for traditional face-to-face courses, with 73% indicating these were "very helpful", including those that have online reading or homework components. Most other course types, including project-based and laboratory, were ranked by only 20-35% of respondents as one of their top preferences. Student preferences for course type tracked very closely with the course types that students have most experienced. Hybrid and completely online courses were the least preferred course styles, with over 25% rating each as "not very helpful." Another third of the respondent population had no experience with these course types (Table 1).

Table 1. A&S undergraduate ratings of different course types. (n=281, participants chose their top 2 for instructors to offer more).

Course type	Top 2	Very Helpful	Somewhat Helpful	Not Very Helpful	N/A: no experience
typical face to face (core instruction happens in class, often have some online components like readings or homework online)	60%	73%	25%	1%	1%
project-based, community service learning, or internship/practicum	35%	32%	32%	14%	22%
classes that involve learning new technology, software, or computer skills	27%	29%	38%	16%	16%
course-based research / independent study	27%	26%	32%	16%	25%
flipped (information presented online, discussion/ activities occur mostly in class)	26%	22%	39%	20%	19%
laboratory	25%	32%	43%	11%	13%
hybrid / blended (1/3 or more class sessions are online instead of face to face)	21%	10%	29%	27%	34%
completely online	7%	6%	23%	38%	33%

We asked A&S students to identify in-class, interactive, and out-of-class learning components that they prefer faculty to use when teaching, as well as to rate how helpful each of these components are for their learning (Tables 2-4). For large classes, over half of A&S students indicated they prefer faculty to lecture, conduct demonstrations, or employ "Just In Time Teaching" methods (in which results of student feedback, formative assessment, or quiz / homework performance inform the next session's teaching). In small classes, students reported preferences for discussions and activities over lecturing (Table 2). They ranked in-class student debates and presentations, and being called on randomly, as their least favorite in-class activities. However, attitudes towards each of these activities were more favorable within the context of small classes. A&S students indicated that outside class, they preferred to review and practice using information in various ways, over writing assignments and viewing videos (Table 3).

A&S students reported most preferring to interact with instructors or peers by attending office hours or optional help sessions (in large classes) and forming small group study sessions (in small classes). Collaborating on group projects was the least preferred activity within large classes (Table 4). For all courses and course components described in Tables 1-4, non-A&S students showed similar patterns of preference (data not shown).

Table 2. A&S undergraduate preferences for components to experience in-class. (n=286, participants chose their top 4 for instructors to offer more).

In-class component	**Top 4: large classes**	**Top 4: small classes**
Demonstrations	67%	44%
lecture full session	65%	28%
professor uses student feedback / homework responses to plan their teaching	55%	49%
whole class discussion / Q&A with professor	40%	56%
short activities / problem solving	38%	51%
short / mini lectures	30%	39%
small group discussion	26%	59%
laboratory activities / research activities	26%	28%
professor calls on students randomly to give ideas / answers	19%	28%
Debates	12%	29%
student presentations	8%	24%

Table 3. A&S undergraduate preferences for components to experience out-of-class. (n=286, participants chose the top 2 they prefer).

Out-of-class component	Top 2: large classes	Top 2: small classes
reviewing materials (your notes, professor's lecture notes, powerpoint slides)	69%	58%
practicing questions and other activities (quizzes, homework, flashcards, simulations, games, analyzing data)	58%	60%
reading textbooks, articles	37%	36%
viewing videos, lecture capture	34%	22%
writing (papers, articles, etc.)	13%	30%
creating art/ creating media / solo performing	8%	23%

Table 4. A&S undergraduate preferences for interactive out-of-class components. (n=282, participants chose their top 2 for instructors to offer more).

Interactive out-of-class components	Top 2: large classes	Top 2: small classes
help room, optional co-seminar, optional review session	54%	29%
office hours with professor or TA	57%	54%
discussions, small group study sessions	49%	68%
working with a tutor / peer tutor / LA	28%	24%
group projects (posters, presentations, webpages, videos, performances, etc.)	17%	38%

Particularly in large classes, students preferred course styles and course components involving more teacher-centered practices, and preferred individual out-of-class work to group work. These preferences run counter to educational practices which research has identified as high-impact, such as active learning, writing-intensive courses, collaborative assignments, and undergraduate research (Kuh 2008). This contrast explains the fact that students tend to complain about active, student-centered teaching practices – at least until they have realized their value. However, techniques do exist to bridge these gaps in preference and perceptions. Instructors may find that including student reflective assignments on their learning, and planning time to discuss the career value and learning rationale for student-centered and collaborative activities, generates changes in these student attitudes. Practical resources related to framing active learning activities are available at http://bit.ly/1n5X0Cg.

Online and hybrid courses were the least preferred course types, with the majority of students either not having experienced them or rating them as “not very helpful”. In the 2014 ECAR national survey of students, almost half of respondents had taken a completely online class in the last year, but less than 20% said that fully online courses were the best way for them to learn. As in our study, the national study indicates that students strongly prefer courses that blend face-to-face instruction with online learning components.

The lack of experience with online and hybrid courses may reflect the CU-Boulder on-campus student population, which has a higher proportion of traditional full-time undergraduates entering from high school and living near campus, compared to other types of schools. Overall, these findings imply that instructors teaching online and hybrid courses should expect that students will need support adjusting to courses relying strongly on online components.

b. Use and Interest in Academic Technologies

A&S students indicated that many academic technology tools are helpful to their learning. We examined types of tools typically used in class, for assignments, and for learning online. Positive student attitudes closely tracked the tools they reported having the most experience with. We found A&S and non-A&S students to have very similar patterns of attitudes around academic technologies.

In-class tools facilitating activities and problem-solving topped A&S students' interests for professors to use, and over 90% reported these types of tools are helpful. Powerpoint, Clickers, and whiteboards are equally highly rated. Students have little experience with tools facilitating in-class discussion, other than Clickers (Table 5).

Despite the relative unpopularity of writing assignments and group projects described in Section 1, students chose tools facilitating research and collaboration on assignments, such as Chinook, Google Docs, and statistical software as their top picks to use more often. A&S students indicated they have little experience with or interest in collaborative reading and discussion tools, as well as information organizing technologies (Table 6).
Over half of A&S undergraduate respondents indicated they are particularly interested in practicing course material online and receiving instant feedback (Table 7). Several other items in this large question block, including online videos, lectures, and simulations, attracted around a quarter of participants' interest to use more. Nearly all online tools were rated as somewhat or very helpful by over 70% of student users, including the D2L platform and its use as a portal for other learning tools. However, online discussions were rated by 37% of A&S students as "not very helpful". 83% of respondents had had experience with online discussions (Table 7). Other online methods of personal interaction were neither widely experienced nor preferred.

Table 5. A&S undergraduate attitudes toward in-class learning tools, and top 2 picks for faculty to use more often. (n=288)

Tool	Top 2	Very Helpful	Somewhat Helpful	Not Very Helpful	N/A: no experience
in class activities, problems (via worksheets, tablets, laptops, simulations, beSocratic, etc.)	44%	51%	39%	7%	4%
Powerpoint, Keynote, etc.	38%	58%	33%	8%	0%
Clickers	32%	43%	38%	15%	4%
whiteboard / blackboard / document camera / overhead projector	28%	52%	39%	8%	2%
in-class question and discussion tools (e.g. Twitter, TodaysMeet, aka "backchannel communication")	16%	27%	25%	14%	34%
other presentation tool (Prezi, Google presentation, Slide Carnival, etc.)	12%	27%	47%	11%	15%

Table 6. A&S undergraduate attitudes toward assignment, research, and collaborative tools, and top 2 picks for faculty to use more often. (n=288)

Tool	Top 2	Very Helpful	Somewhat Helpful	Not Very Helpful	N/A: no experience
collaborative project, writing, editing tools (wikis, PBWorks, Weebly, Google Drive, Dropbox, Adobe Connect)	49%	46%	34%	9%	12%
research tools (Chinook, pubMed, Google Scholar)	37%	40%	37%	6%	17%
data analysis tools (SPSS, R, Latex, Excel, Stata, NVivo, MatLab, etc.)	26%	28%	38%	13%	21%
e-portfolios (online collection of your work in a course or across a major)	19%	21%	23%	9%	47%
collaborative reading and discussion tools (e.g. NB, NotaBene, Highlighter, VoiceThread)	17%	16%	24%	12%	48%
information organizers (Mendeley, Zotero, Evernote)	12%	15%	22%	13%	51%

Table 7. A&S undergraduate attitudes toward online learning tools, and top 4 picks for faculty to use more often. (n=286)

Tool	Top 4	Very Helpful	Somewhat Helpful	Not Very Helpful	N/A: no experience
online practice problems, quizzes	57%	63%	30%	6%	1%
instant feedback on online problems/ quizzes	56%	75%	18%	4%	3%
videos, animations	35%	42%	45%	8%	5%
readings: online textbooks, articles, e-books	27%	33%	47%	19%	1%
D2L as a portal to other learning tools (homework websites, videos, simulations, Nota Bene/NB, Voice Thread, etc.)	25%	42%	41%	10%	7%
online lectures, Lecture Capture	24%	34%	30%	14%	22%
simulations, PhET, educational games	23%	26%	38%	12%	23%
D2L course platform	21%	38%	44%	15%	3%
online tutorials and trainings (OIT tutorials, Lynda.com videos)	16%	25%	32%	13%	30%
online office hours (via Skype, Google Hangouts, etc)	14%	17%	22%	13%	48%
online tutoring (writing, problem solving, etc)	13%	19%	33%	13%	36%
online discussions	11%	15%	36%	32%	17%

Overall, A&S student ratings of the helpfulness of many academic technology tools were quite positive – particularly those that facilitate active learning with feedback. In a parallel finding from a national study of undergraduates by Educause, around 75% of students were very interested in being able to access "personalized" practice problems (ECAR, 2014). Students were also strongly positive about tools that enhance collaboration, such as Google Docs. These results stand in contrast to these students' stated "traditional" preferences for course types and course components (Tables 1 and 2).

These contrasting findings could be interpreted to suggest that when active learning, written assignments, and projects are incorporated into courses, students readily recognize that academic technologies enhance their learning experiences. Therefore, instructors can expect generally open student attitudes to almost any of the technologies above (with the exception of online discussion). Although online practice materials with rapid feedback might take some time to initially prepare, or cost to purchase from publishers, these findings predict such investments will be particularly appreciated by students.

Online discussions have the lowest helpfulness ratings of any learning technology. In contrast, most students want instructors to use whole class and group discussions more than lecturing, in small face-to-face classes (Table 2). Since students generally value discussion, these results indicate that technology and design are barriers to productive online discussion. Students frequently complain that online discussions are not organized in a way that can be easily followed. Alternative online discussion platforms exist but are not widely known or used. This finding indicates that online discussion is an area that needs additional technical and design development, dissemination, and instructor support. Instructors using online discussion will need to frame their activities carefully to generate student buy-in.

c. Digital Distraction

Here, we define digital distraction as off-task behavior while using digital devices in class. Distraction from phone use affects course performance of both users and their nearby peers in class (Duncan et al. 2012). In our companion survey of CU-Boulder faculty and graduate students, instructors are increasingly concerned with this phenomenon, but unsure which policies are effective in moderating it. We asked students to describe what they would most like faculty to do about digital distraction. Their responses differed depending on class size.

For large classes, students preferred either establishing no policy around digital distraction or establishing a device seating zone (a designated area in the classroom where device users voluntarily sit). All other options were less popular, but enforcing any policy and banning laptop use were the least preferred options. For small classes, top choices varied across the spectrum of options, from banning phone use, discussing the problem, and doing nothing. Most choices garnering the support of at least one third of the respondents, but discussing the problem and banning phones were the top choices.

Table 8. Undergraduate opinions about digital distraction policies. (n= 280, participants chose their top 3 for instructors to offer more).

Response to distraction	Top 3: large classes	Top 3: small classes
do nothing, leave choices up to individual students	64%	42%
make a device seating zone (for all laptop and phone users)	51%	30%
discuss why it is a problem, show how it impacts learning / grades	38%	44%
make multitasking seating zone (just for those planning to multitask with devices)	38%	26%
have students vote in a digital device policy for the course	31%	36%
limit or ban phone use in class	31%	45%
enforce the device use policy of the class (points off, call out policy-breakers, ask students to move to a zone)	22%	33%
limit or ban laptop / tablet use in class	19%	33%

The lack of student consensus on the topic of digital distraction, particularly in small classes, predicts that any policy that instructors adopt could garner support from some students and discontent from others. For instructors that wish to moderate student distraction, establishing a device zone appears to be the course of action most palatable to students in large classes, and banning phones most supported in small classes. There is also good support around instructors discussing the impacts of distraction.

d. Attitudes to Digital Communication, Skills, Preparation, and Connection

Student experiences with technology influence their development of 21st century literacy and work skills. Most A&S students prefer established methods of communication with instructors, such as email and face-to-face out of class interactions (Table 9). While most A&S students indicated they believe they communicate professionally via digital means "very well", this skill was also the top one they would like help in developing. More than 80% of A&S students rated themselves as fairly skilled in finding, organizing, and vetting digital information (Table 10). However, non-A&S students identified finding and organizing digital information to be the areas they need most support (data not shown). Skills which the largest proportion of A&S students said they were "not very well" skilled at were creating digital content (23%) and avoiding digital distraction (27%) (Table 10).

Technology also influences student relationships with instructors and peers, and feelings of belonging and connection within the University. A lack of technology preparation could produce barriers to success both socially and academically for students. Using questions from the ECAR Study of Undergraduate Students and Information Technology (Dahlstrom and Bichsel, 2014), we inquired about these aspects of student technology experiences (Table 11). While less than 10% of A&S students felt they were poorly prepared to use technology in their courses, 48% wish they had been better prepared to use CU-specific technologies such as the registration system, D2L, or Chinook. Majorities of students think technology helps them feel connected to the University, their instructors, and each other.

Table 9. Undergraduate preferences for communicating with instructors and TAs. (n = 253)

Communication type	
Email	89%
face to face / office hours	86%
before / after class	73%
online discussion forum / online group office hour	18%
online chat / messaging	11%
text message / SMS	11%
social media (Facebook group / Google Group / Twitter, etc)	4%
video chat / Skype	3%

Table 10. Undergraduate self-assessment of digital literacy skills, and top 2 choices for the University to better support student skill development. (n=283)

Digital literacy skill	Top Picks	Very Well	Sort of Well	Not Very Well	N/A: no experience
communicating professionally via email, online discussion, video calls (Skype, Zoom, Facetime etc)	29%	53%	33%	9%	5%
creating digital and web content (making a website, using a wiki, blogging, making a powerpoint presentation, making a poster)	29%	25%	43%	23%	9%
finding digital information (via library, journal websites, etc.)	27%	48%	40%	10%	2%
keeping digital information organized	24%	46%	38%	14%	2%
avoiding digital distraction when you don't want it	21%	30%	41%	27%	3%
learning how to find new / getting help finding new digital information	19%	44%	46%	8%	2%
validating the accuracy of digital information	16%	31%	49%	15%	5%

Table 11. Undergraduate perceptions about digital connection and preparation for using technology. (n=287)

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
when I entered college, I was adequately prepared to use technology needed in my courses	36%	42%	13%	8%	1%
technology makes me feel connected to what's going on at the University	29%	53%	13%	4%	2%
technology makes me feel connected to my professors	22%	53%	14%	9%	2%
technology makes me feel connected to other students	19%	42%	22%	14%	3%
I wish I had been better prepared to use University-specific technology when I entered college (course registration, department websites, D2L, Chinook, myCUinfo, etc.)	18%	30%	25%	21%	7%

About 20% more A&S students reported feeling connected to the University, instructors, and each other, compared to those responding to the 2014 Study of Undergraduate Students and Information Technology (Dahlstrom and Bichsel, 2014). While this difference could reflect greater perceptions of connectedness at CU-Boulder, it could also be due to sampling and response rate differences between the two studies. In our smaller study, students interested technology are likely overrepresented. However, it is most likely that CU is on par with other institutions represented in the ECAR 2014 study in having a majority of students feeling that technology benefits their feelings of connectedness.

The greatest preparation deficiency found in both this and the 2014 ECAR student study was reported at the level of University-specific technologies, nearly half of the students in each case. This result implies incoming students need greater support with these technologies. However, student needs in these areas likely vary by technology or portal, warranting further research.

D. Participant Demographics

Table 12. Gender distribution of all undergraduate participants. (n=470) 2015 CU-Boulder institutional student enrollment was 55% female : 45% male (http://www.colorado.edu/pba/cds/ cds16/index.htm)

Female	57%
Male	42%
Other	1%

Table 13. School, college, or program affiliations of all undergraduate participants. (n=470)

Answer	Count	Percentage
Arts and Sciences	289	61%
Engineering	97	21%
Business	40	9%
CMCI	18	4%
Not affiliated	10	2%
Environmental Design	8	2%
Music	4	1%
Continuing Education	2	<1%
Education	2	<1%

Table 14. Proportions of A&S undergraduate students in each class year. (n = 289)

first year	29%
sophomore	23%
junior	20%
senior	18%
super senior (5th year and beyond)	8%
non degree seeking / auditor	1%
graduate student	< 1%

Table 15. Group affiliations of A&S undergraduate student participants. (n = 180)

	Count	Percentage
RAP (Residential Academic Program)	61	21%
first generation (for example, parents, grandparents did not go to college)	58	18%
under-represented minority	31	11%
have a learning, physical, or mental health disability	26	9%
student-athlete	25	9%
international student	18	6%
MASP (Miramontes Arts and Sciences Program)	11	4%
LA (learning assistant)	10	4%
veteran or ROTC (Reserve Officers Training Corps)	6	2%

Table 16. Departmental affiliations of all undergraduate participants. (n=467)

Answer	Number	Percentage	Answer	Number	Percentage
Psychology & Neuroscience	58	12%	Civil, Environmental & Architectural Engineering	6	1%
Undetermined	38	8%	MCD Biology	6	1%
Integrative Physiology	31	7%	Art and Art History	5	1%
Mechanical Engineering	21	5%	Environmental Engineering	5	1%
Computer Science	19	4%	Film Studies	5	1%
Chemistry & Biochemstry	15	3%	Geography	5	1%
Engineering	15	3%	Geological Studies	5	1%
Aerospace Engineering Sciences	13	3%	Accounting	4	1%
EE Biology	14	3%	Architecture	4	1%
Communication	12	3%	Asian Languages and Civilizations	4	1%
English	12	3%	Journalism	4	1%
Marketing	12	3%	Linguistics	3	1%
Chemical & Biological Engineering	11	2%	Management & Entrepreneurship	3	1%
Finance	11	2%	Anthropology	2	< 1%
Economics	10	2%	Music	2	< 1%
Electrical, Computer and Energy Engineering	10	2%	Philosophy	2	< 1%
Astrophysical & Planetary	9	2%	Spanish & Portuguese	2	< 1%
Environmental Studies	9	2%	Technology, Arts & Media	2	< 1%
Political Science	9	2%	Theatre & Dance	2	< 1%
Advertising, PR and Media Design	8	2%	Voice and Opera	2	< 1%
Business	7	2%	Women and Gender Studies	2	< 1%
Environmental Design	7	2%	Applied Mathematics	1	< 1%
International Affairs	7	2%	Continuing Education	1	< 1%
Mathematics	7	2%	History	1	< 1%
Physics	7	2%	Media Studies	1	< 1%
Sociology	7	2%	Nursing	1	< 1%
Speech, Language & Hearing Sciences	7	2%	Photography	1	< 1%
			Total	467	100%

E. References

Dahlstrom, Eden, and Jacqueline Bichsel. 2014. ECAR Study of Undergraduate Students and Information Technology. Research report. Louisville, CO: ECAR, October 2014. Available from http://www.educause.edu/ecar.

Duncan, D.K, Hoekstra, A.R, and B.R. Wilcox. 2012. Digital Devices, Distraction, and Student Performance: Does In-Class Cell Phone Use Reduce Learning? Astronomy Education Review 11: 010108-1, 10.3847/AER2012011

Kuh, G.D. 2008. High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter. Washington, DC: AAC&U.