Cornell Academic Learning Management System Evaluation Project

Final Report
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The Academic LMS Evaluation Project is a capital project sponsored by Professor Julia Thom-Levy PhD, Vice Provost for Academic Innovation.

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Executive Summary

From December 2016 – February 2018 staff members in the Center for Teaching Innovation (CTI) and Cornell Information Technologies (CIT) conducted a thorough evaluation of Cornell's options for an academic Learning Management System (LMS). Cornell's current contract with Blackboard Inc. will come up for renewal in June 2018 and an evaluation of Cornell's main academic LMS had not been performed in ten years. The market for LMS products is extremely competitive, with the market leaders competing for market share based largely on regular improvements and innovation. At Cornell, most schools and colleges use Blackboard to some degree though eCornell and the ILR school's executive education programs use another product, Canvas. Cornell Weill Medicine also uses Canvas, and the College of Veterinary Medicine has indicated that it may also switch to Canvas in the near future. In the Computer Science and CIS programs, some faculty use an internally-developed system instead of Blackboard. The project team's charge was to provide university leadership with objective data that will allow Cornell's leaders to make an informed decision in line with Cornell's overall priorities.

Cornell's evaluation considered the three top contenders, Blackboard, Canvas, and Brightspace from multiple perspectives. Groups of campus stakeholders were interviewed to identify requirements for LMS software. 2,566 faculty members were surveyed (and over 700 responded) regarding their current LMS experiences and needs. Survey responses were analyzed collectively and across a series of demographic variables. Student round table sessions were conducted, and the student body was surveyed via Blackboard. Over 50 faculty members were interviewed individually. Finally, a one-semester pilot of the possible alternative systems was conducted including 32 courses and 1,712 students. Each of these sources provided information about teaching and learning experiences at Cornell that will be useful beyond the scope of this evaluation.

The evaluation also included an investigation of anticipated future teaching needs. The project team reviewed the LMS choices made by Cornell's peer institutions. Most peer institutions identified either use Canvas or are in the process of switching to it. In addition, standard analyses of technology, security, and financial costs were conducted. The results are summarized in this report, with full details available in the appendices.

Though there are some strong individual opinions in favor of specific alternatives, taken as a whole the university faculty indicated that they were generally satisfied with the current system but are open to new opportunities if there is an improvement. Students participating surveys or focus groups did not express a strong preference for any specific system but emphasized the need for one standard system across Cornell. Technical analysis did not find any major differences among the competitors, though each product has its own particular strengths and weaknesses. The one-time cost of switching systems is a critical item for consideration. In addition to these considerations, a decision to switch systems may represent an opportunity for Cornell to invigorate campus interest in innovations in teaching and learning. A change would be an opportunity to re-open conversations with Cornell units that have already decided against using the current central tool set. Additionally, all three contenders can be extended via custom API-based integrations, and Canvas is also an open-source application, which would give interested Cornell faculty the ability to submit custom-developed plugins for inclusion in the Canvas product itself. The possibilities presented by a renewed campus conversation in this area may

stimulate faculty interest and innovation that will move Cornell's teaching and learning environment forward.

Summarizing the results, each LMS is considered in turn.

Blackboard Learn meets the needs of most Cornell faculty who currently use it for their courses. It has a robust set of tools, most faculty express satisfaction with it, and staying with Blackboard would not require the costs associated with transition. On the other hand, the Blackboard user experience is overdue for updating; many faculty commented on the outdated design and do not find it easy or intuitive to use. Staying with Blackboard will not bring more of the Cornell campus together in a single system and it will make it more difficult to engage faculty in renewed consideration of teaching and learning.

Note: Blackboard Ultra was not ready to be tested as part of this evaluation and is not under consideration at this point, but could be considered in the future if Cornell remained with Blackboard.

Brightspace offers a clean, modern, customizable interface. Engineered with course design in mind, it is equipped with the necessary tools to meet most faculty needs. It is less expensive than the other systems, though the cost of conversion to a new LMS would outweigh any savings from the lower price. Migrating courses from Blackboard to Brightspace is relatively easy. On the other hand, building courses in Brightspace proved a significant adjustment for faculty, and faculty found the gradebook functionality particularly frustrating. Pilot faculty, on the whole, did not prefer Brightspace to Blackboard. Few peers use Brightspace.

Canvas would work well for most Cornell faculty. It has a clean, modern interface that most pilot faculty found easy to use. Six out of ten pilot faculty would prefer to use Canvas; most of those that would not were advanced Blackboard users who depend on specific tools. Switching to Canvas would provide an opportunity to engage the Cornell faculty in a consideration of their teaching and encourage innovation. Furthermore, Canvas is the LMS used by most of our peers. Combined with Canvas's emphasis on easily integrating third-party tools, open source framework, and community-driven development, Canvas provides the agility to develop and implement tools to meet specific Cornell needs. Canvas also offers the possibility to unite more of the Cornell community in using a single LMS, and enable sharing of teaching resources already created on Canvas. On the other hand, transitioning to a new LMS requires significant conversion costs. In addition to the costs of running two systems during the transition, this includes faculty time in learning the new system, and the additional support resources needed to make the transition worthwhile.

Table of Contents

Table of Figures

1. Introduction

This report is the product of an evaluation project conducted by Cornell's Center for Teaching Innovation (CTI) and Cornell Information Technologies (CIT) December 2016–December 2017. The evaluation focused on determining Cornell's current and future Learning Management System (LMS) needs based on feedback from across the university, including:

- A campus-wide survey of all faculty.
- Over 50 faculty interviews.
- A campus-wide survey of students.
- Student focus groups.
- Input from academic support staff and administrators.
- A hands-on pilot of all three systems under consideration, which included 32 courses and approximately 1,500 students during the summer and fall 2017 academic terms.

1.1. Project Rationale

In December 2016, Cornell began a review of its academic learning management system, Blackboard Learn, its first review since 2007. Our current Blackboard contract will be up for renewal June 30, 2018. This gives Cornell the opportunity to re-assess its learning management needs and evaluate a range of alternatives (including Brightspace, Canvas, and Blackboard Ultra).

Currently hosted off-campus by Blackboard Inc., the system houses over 2,000 courses per semester from across the University and is utilized by almost every student. Every day, it plays a significant role in teaching and learning at Cornell. It is vital that we have a system that both meets current faculty needs and positions us to adapt to the changing educational landscape. Not all faculty choose to use an LMS, either because they do not believe they need the tools provided by an LMS or they are unhappy with available options. Figure 1-1 lists the current systems used at Cornell.

College or School	LMS used
College of Agriculture and Life Sciences	Blackboard
College of Architecture, Art and Planning	Blackboard
College of Arts and Sciences	Blackboard
Cornell SC Johnson College of Business	Blackboard
The Hotel School	Blackboard
Dyson	Blackboard
College of Engineering	Blackboard
College of Human Ecology	Blackboard
School of Industrial and Labor Relations (ILR)	Blackboard and Canvas
Computing and Information Science	Blackboard and CMS (homegrown CIS system)
Cornell SC Johnson College of Business	Blackboard
Cornell Tech (New York City)	Blackboard
Cornell Law School	Blackboard

College of Veterinary Medicine	Blackboard
Weill Cornell Medicine	Canvas
eCornell	Canvas

Figure 1-1. List of what LMSs currently used at Cornell

1.2. Project Objectives

One of our primary goals with this evaluation was to include the faculty, students, and staff so that each had a voice and contributed to a fair and comprehensive analysis.

Our project objectives are:

1. Identify Cornell's current academic community needs for a Learning Management System (LMS).
2. Assess the ability of different LMS options (including the current system) to meet current needs while best positioning Cornell for the future in a rapidly changing higher education landscape.
3. Present an analysis report to the Faculty Senate and to the Provost that can form the basis of a decision on which option Cornell will pursue.

2. Market Analysis

The LMS market for Higher Education is currently saturated with options and is shaped by four major competing products: Blackboard Learn, Brightspace, Canvas, and Moodle (Hill, 2017). The industry has been influenced by four major trends over the last five years:

1. Adoption of Software-as-a-Service (SaaS) as a model rather than building and hosting systems on-premises at the institution (Cornell moved from on-premises to a vendor-hosted model with Blackboard in 2015).
2. A focus on improving the faculty and student user experience provided by the LMS, including support for mobile devices.
3. Positioning the LMS as a hub for integrating with other more-specialized instructional tools (Some of Cornell's current Blackboard integrations are with lecture-capture tools, classroom polling tools, a plagiarism detection tool and the Cornell University Library's course reserves).
4. Use of cheap, standardized, scalable commodity cloud computing infrastructure providers such as Amazon Web Services (AWS) or Rackspace.

Issues of scale are significant when considering deployment and management of an LMS. Both the average and median sizes of institutions using Moodle are less than 65% of the average and median sizes of institutions using the other three major products (Edutechnica, 2017). It holds a market share of 25% of US and Canadian Higher-Ed institutions, but in terms of student enrollments, its market share is only 12%. It was not considered as part of Cornell's evaluation due to concerns that despite its popularity at smaller schools it would not scale to meet Cornell's need for centralized LMS.

Founded in 1997, Blackboard has held a dominant position in the market since 2001, while Canvas, founded in 2009, has continued growing its market share rapidly since 2011. Desire2Learn, which rebranded as Brightspace in 2014, has enjoyed the steady gradual growth of its market share since its foundation in 1999. During the period of this evaluation project (Fall 2016–Fall 2017) Blackboard's market share decreased from 31% to 28%, while Canvas's share rose from 17% to 21%, and Brightspace's share rose from 11% to 13% (Hill, 2017).

Since 2009, Blackboard has suffered the challenge of continuing to innovate while maintaining commitments to support its wide range of features in legacy products and the use of older software versions by some customers. In 2016, Blackboard announced a significant resource shift to support innovation and development of the new Blackboard Ultra Experience. Blackboard has steadily expanded the functionality of the Ultra Experience, even during the evaluation. Blackboard has also shifted more of its customers from traditional on-premises environments to vendor-hosted options and has expanded its use of Amazon Web Services infrastructure (Feldstein, 2017). While these represent positive steps, they are still in progress and Blackboard continues to "play defense" in the market.

Canvas has consistently been positioned as the default alternative to Blackboard. Instructure released Canvas as open-source software, which provides community members the option to alter the application code and develop custom modifications and enhancements. It has facilitated the formation of a community of Canvas customizers and innovators. Instructure offers Canvas

exclusively as a vendor-hosted SaaS option. Its growth in the market has been focused heavily on North America, with 2017 being the first year that new installations of Canvas outside the U.S. represented more than 12% of the overall number of new installations of Canvas (Hill, 2017b). Instructure continues to post operating losses while it continues to increase its market share.

Desire2Learn has had a strong record of customer retention, and the gradual growth of its market share has been reinforced by its reinvestment and rebranding as Brightspace in 2014 (Hill, 2017a). Part of D2L's approach is to create a partnership with their clients. In the past, this has resulted in providing research grants and the creation of improvements and tools to their system. One example of this is a game-based learning solution tool, originally launched at Lambton College (Desire2Learn, 2014).

Conclusion

If Canvas is considered a "next step" response to Blackboard, it is perhaps fair to say that both Blackboard Ultra and Brightspace represent a similar response to the success of Canvas. All three products continue to try to leapfrog each other while continuing to serve the same basic purpose with the same basic architecture. So far, the number of institutions relying on Canvas continues to grow faster than the number of institutions adopting Brightspace, with Blackboard trying to retain its market share.

The following are examples of the first page instructors see upon logging into the three LMS Pilot systems:

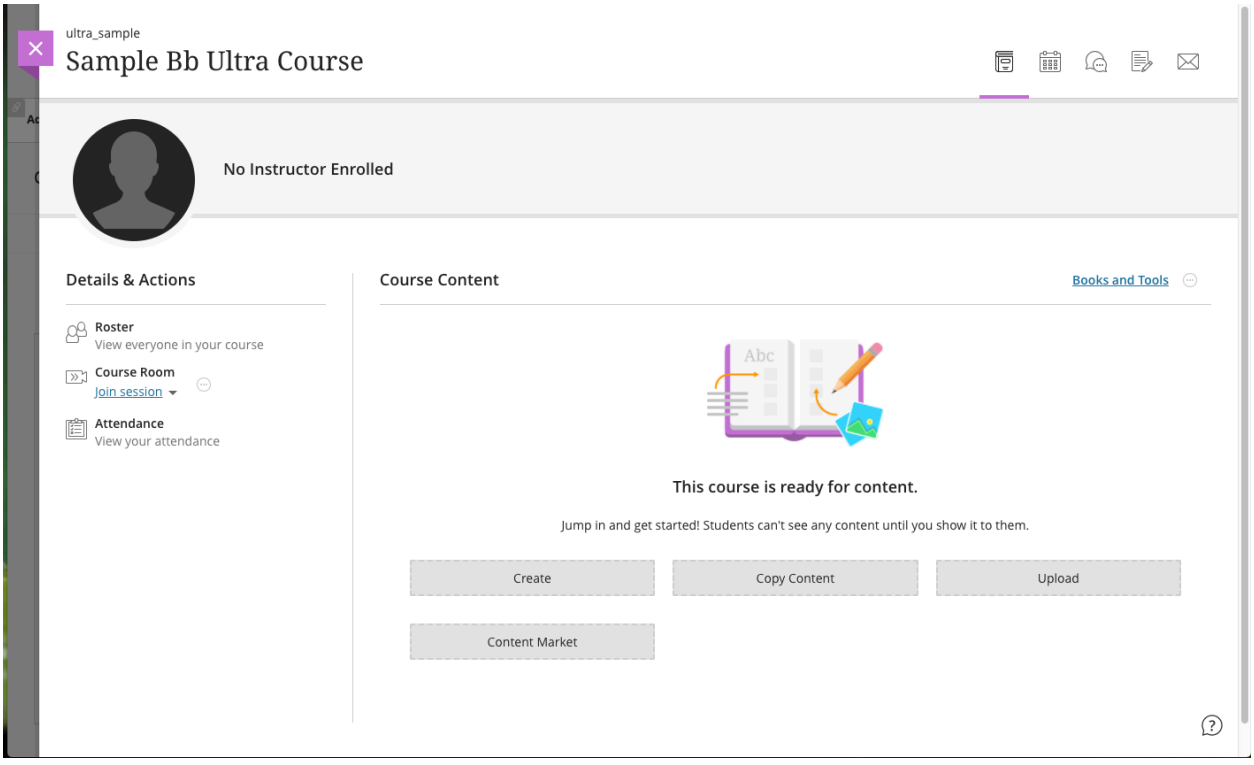


Figure 2-1. Screenshot of a sample course in Blackboard Ultra

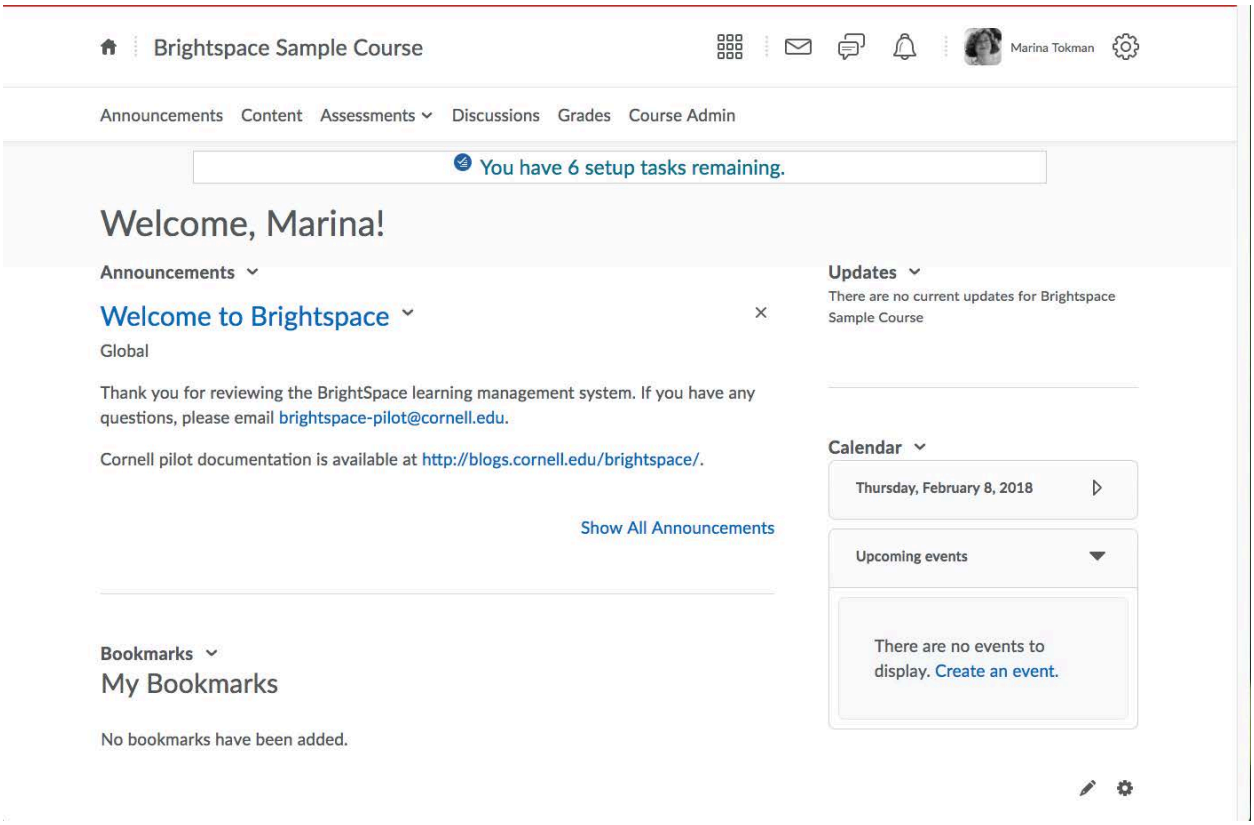


Figure 2-2. Screenshot of a sample course in Brightspace

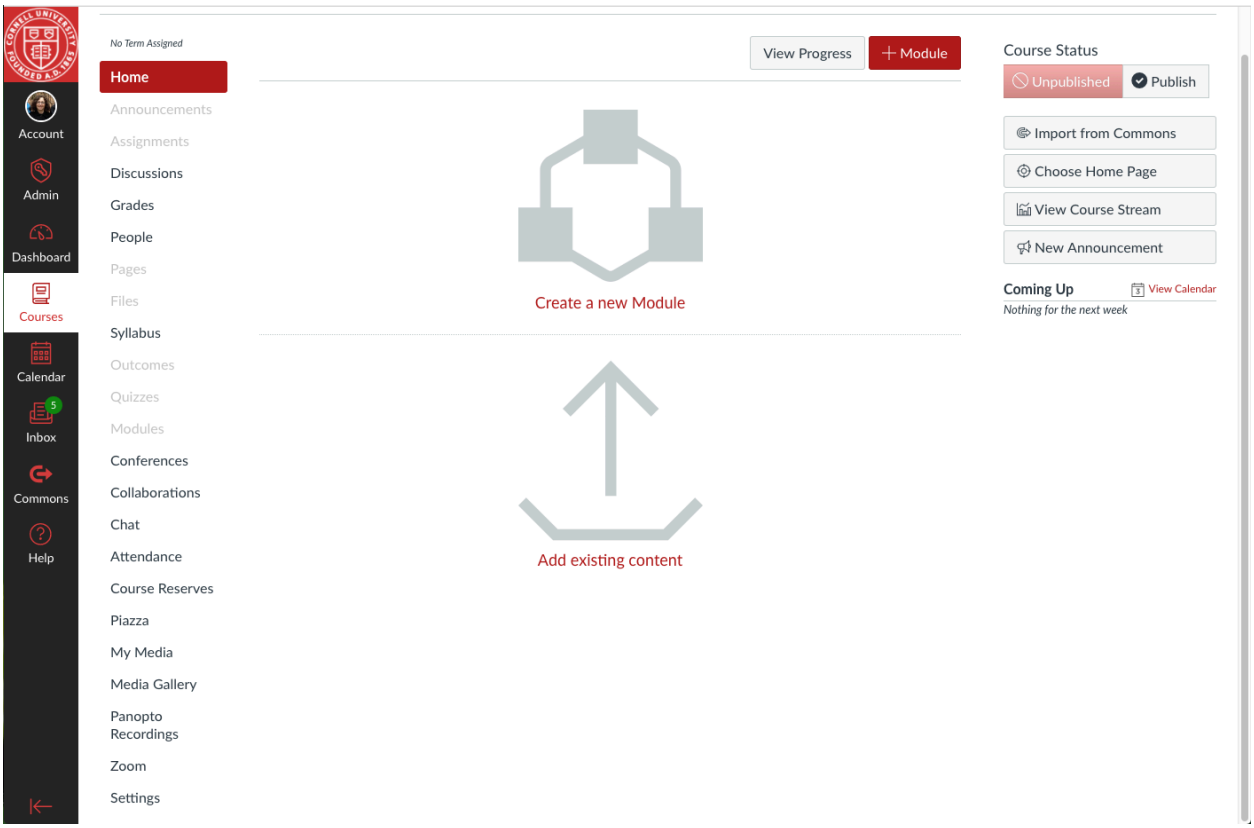


Figure 2-3. Screenshot of a sample course in Canvas

3. Teaching, Learning and the Future of the LMS

Summary: Cornell's commitment to improving teaching and learning necessitates an LMS that facilitates pedagogical innovation. The future of the LMS involves moving beyond course management functions to expand the use of evidence-based teaching methods and to engage faculty in making use of learning analytics to facilitate student learning. Supporting teaching innovation requires an LMS that is easy to use, facilitates learning, and is agile and adaptable.

Provost Michael Kotlikoff describes the "crucial steps" Cornell has recently undertake to "underline our commitment to the teaching and learning environment for faculty and students," (Wilensky, 2017). These steps include naming Julia Thom-Levy as the Provost's Fellow for Pedagogical Innovation, and then selecting her to become the University's first Vice Provost for Academic Innovation. Thom-Levy led the effort to merge the existing Center for Teaching Excellence and Academic Technologies into an integrated new Center for Teaching Innovation (CTI).

By combining pedagogical expertise with expertise in technological teaching tools, the CTI is tasked with expanding faculty use of evidence-based teaching practices and adoption of technologies that promote learning. Provost Kotlikoff described the CTI's role as expanding "curriculum innovation, instructional design, teaching analytics and the embrace of new technology."

The CTI will support existing efforts such as the Active Learning Initiative, help seed teaching innovation projects across campus, and act as a greenhouse for incubating efforts to improve teaching and learning at Cornell. The LMS evaluation process grows out of these initiatives, with the goal of choosing an academic learning management system that can support pedagogical innovation.

This underlines the importance of identifying which LMS better facilitates learning. Which system is better able to assist Cornell in achieving its commitment to finding innovative ways to integrate evidence-based teaching practices into more Cornell classrooms? The chosen system will need to support a range of practices that include:

- Current initiatives to increase active learning throughout the undergraduate curriculum
- Social and collaborative learning
- Universal design for learning and accessibility
- Inclusive classroom practice
- An increasingly robust blending of online and face-to-face learning
- Increasing use of data analytics to better understand student learning and to help design learning interventions.

National surveys suggest that the current LMSs are most effective in performing class administration tasks. Both students and faculty report satisfaction with the course management functions of the systems. The same study found less faculty adoption, and lower student satisfaction, with tools that require active student engagement (such as discussion boards)

(Pomerantz, Brown, & Brooks, 2017, pp. 12–13). This sets a clear task for the future. “The overarching goal of next-generation LMS is to shift the focus of these platforms from enabling administrative tasks to deepening the act of learning” (Becker et al., 2017, p. 44).

According to the 2017 Horizon Report, the “…essential attributes of next-generation digital learning environments [are] interoperability; personalization; analytics, advising, and learning assessment; collaboration; and accessibility and universal design.” These LMSs will enable faculty to “unbundle all of the components of a learning experience and allow them to remix open content and educational apps in unique and compelling ways” (2017, p. 44).

At Cornell, this includes:

1. Exploring an ever-widening range of educational technology tools.
2. Creating a shareable bank of digital learning assets such as video lectures, demonstrations, and animations that can be used by different faculty, an effort currently underway.
3. Sharing the large numbers of online course materials created by Cornell faculty for massive open online courses (currently housed on edX) and for eCornell courses (currently housed in Canvas) for use in flipping classrooms or for increasing adaptive and self-paced learning.
4. Given the high and unpredictable nature of change, it also means identifying which LMS is more likely to integrate new tools quickly, and to integrate third-party tools most expeditiously and effectively.
5. Identifying which company is more likely to adapt most quickly and effectively to new directions in learning technology development.

Having an LMS that integrates with new tools quickly is only the first half of the equation. Cornell needs to be prepared to quickly evaluate and adapt to new educational technologies. The current practice is to have a CIT security employee perform an exhaustive evaluation and this review process can sometimes take months (partially due to CIT’s backlog). Going forward, streamlining the process will help Cornell stay up to date with the educational technology and the changing Higher Education landscape. It will help Cornell leverage the LMS's ability to facilitate learning.

Throughout the evaluation, we found ourselves repeatedly asking a series of questions about each LMS. These questions, outlined below, provided an additional clarifying lens by which we viewed the systems.

How intuitive is it to use?

A key factor in facilitating the adoption of evidence-based teaching methodologies, and in moving beyond using the LMS for course administration, is ease of use. An interface that is easy and intuitive to understand and navigate, and tools that are easy to implement, adapt, and modify, are of the first importance. There is an important distinction between the systems on usability. Canvas has developed a clean and modern interface, and is now focused on adding tools and functionality. Blackboard and Brightspace have developed a solid core of tools and functionality,

and are now invested in improving usability through an updated interface. Usability is further evaluated in the pilot section of this report.

How easily does the LMS integrate with third-party tools?

Integrating teaching practices such as active learning, more robust blended learning, social and collaborative learning, and adaptive learning, requires a set of tools that allow faculty the flexibility to adapt the technology to their teaching goals. This can come from the set of tools built in to the LMS. Functionality is evaluated in the requirements section of this report. It can also come – and increasingly does – from integrations with a wide and growing range of third-party tools. Integration capacities are reviewed in the technical requirements section of the report.

What is their roadmap for change/growth?

The last variable that has an impact of the ability of the LMS to develop as a tool to enable learning is adaptability. Predicting what the LMS will do in five years is difficult, as a review of earlier predictions shows (Becker et al., 2017, pp. 4–5). It is important to have an LMS with a proven record of innovation and of quickly bringing new tools into the system. For instance, Blackboard develops its five-year roadmap in response to its large and varied client base, and its own research and data on student learning. Brightspace's roadmap is developed similarly, and is guided by research on evidenced based teaching methods. Instead of developing a longer roadmap, Canvas looks ahead at only the next two years. New features and innovations are largely driven by their community of users, who share their ideas and vote on what they would like to see put into development.

How will we encourage faculty to take advantage of the teaching tools available?

Cornell faculty have enormous demands placed on their time. A robust set of teaching tools is not useful if faculty are unaware they exist. Changing learning management systems provides a unique opportunity for faculty to look at existing course materials and consider engaging in pedagogical innovation. It is one opportunity to ask all Cornell faculty to consider how they are using the learning management system to support student learning. Without that change, efforts to reach faculty will proceed on a piecemeal basis.

4. Institutional Peer Review

Summary: Paralleling changes throughout higher education in the United States, there has been substantial movement towards Canvas among our peers over the last five years. Seventy-five percent of the Ivy League, and 67% of our designated peer group, are now Canvas schools.

There is a good deal of transition in Learning Management Systems in higher education, and this is reflected in a look at peer institutions. Of our most direct peers, the other Ivy League schools, six use Canvas, with most having adopted Canvas in the last three years. Three schools transitioned from Blackboard to Canvas, while the other three were previously using Sakai or a homegrown system. Princeton, like Cornell, continues to use Blackboard.

Schools that switched from Blackboard to Canvas cited a strong set of tools, an easy-to-use interface, and continuous updates through cloud-based hosting. Schools such as the University of Pennsylvania cited the desire to move the entire university to a single LMS. Penn had some schools using Canvas while the majority of the campus used Blackboard. The decision to switch to Canvas unified the campus.

Schools that used homegrown versions of open-sourced platforms such as Moodle and Sakai moved to Canvas because they were seeking more functionality and were tiring of the costs of maintaining their systems. Stanford, for example, said, “it was no longer viable for us to maintain and enhance the platform to meet the growing needs of teaching and learning on campus” (Standford University, n.d.).

Broadening the scope of our peers, the story is similar. Most schools who have conducted an evaluation in the last five years have chosen to pilot Canvas.

Cornell has been unusual in conducting such a rigorous and comprehensive pilot as part of the evaluation. Most schools have only piloted one alternative system, and they have invariably chosen Canvas rather than persist with their existing system. It is important to note that there is wide variability in how pilots are conducted. For many schools, the pilot is less a part of the evaluation and more a proof of concept.

The one exception is Vanderbilt, who conducted a small, summer pilot of both Canvas and Brightspace, and selected Brightspace. Vanderbilt’s Provost, Susan R. Wente, said this about the decision, “The move to Brightspace is part of Vanderbilt’s ongoing strategic effort to embrace educational technologies that foster innovation in learning, teaching, and discovery” (Vanderbilt University, 2017).

In addition to our peer group of elite research institutions, we looked at peers for specialized Cornell programs. For many programs such as business or law schools, the overlap with our general peers is substantial. For others, such as Veterinary Medicine and Hotel Administration, we identified specific peers. Most peers in Veterinary Medicine are using Canvas, with the only major exception being North Carolina State, using Moodle.

Peers in Hotel Administration are spread across the systems we are piloting. The University of Nevada at Las Vegas and the University of Houston each use Blackboard Learn, The University of Central Florida, and Virginia Tech both use Canvas, while Michigan State University uses Brightspace.

Institution	Current LMS
Ivy League	
Brown University	Canvas
Columbia	Canvas (CourseWorks2)
Dartmouth College	Canvas
Harvard University	Canvas/Brightspace[1]
Princeton University	Blackboard Learn
University of Pennsylvania	Canvas
Yale University	Canvas
Ivy+ Schools	
MIT	Stellar (homegrown)
University of Chicago	Canvas
Duke	Sakai
Stanford	Canvas
Other peers	
Carnegie Mellon	Canvas
Johns Hopkins	Blackboard Learn
Northwestern	Canvas
The University of California at Berkley	Canvas
University of Michigan	Canvas
The University of Texas at Austin	Canvas
Vanderbilt	Brightspace
Veterinary Medicine	
The University of California at Davis	Canvas
Colorado State	Canvas
North Carolina State	Moodle
Ohio State	Canvas

[1] Harvard Business Publishing and Harvard Business School use Brightspace

Hotel Administration	Current LMS
Michigan State University	Brightspace
University of Central Florida	Canvas
University of Nevada - Las Vegas	Blackboard Learn
Virginia Tech University	Canvas

Figure 4-1. List of peer institutions and what LMS they are currently using

5. Gathering Methods

Summary: The evaluation process was designed to include feedback from across Cornell's diverse landscape. This included an evaluation website with project updates and feedback mechanism, a review of our peers, interviews with faculty, surveys of faculty and students, public information sessions, round table discussions with students, requirement workshops, and pilot system feedback.

One of our guiding principles throughout the entire evaluation process was a dedication to engaging with stakeholders from across the Cornell campus. The evaluation process was specifically designed to include Cornell's full range of academic disciplines, colleges, students, and faculty.

Below are a list and description of the main gathering methods utilized throughout the project. Many of the gathering methods are discussed in detail later on in the report. Others acted as initial discovery projects for the evaluation team (such as the institution peer review) or were ongoing methods of feedback (such as the evaluation website and observations).

Method	Description
Evaluation Website:	Information about the project, including periodic project updates, was displayed on a website dedicated to the project (it.cornell.edu/lmseval). The website also offers a feedback form for faculty and students to interact with, along with a form for faculty members to request an empty practice course.
Institutional Peer Review:	Gathered data, evaluation models, and methods from other institutions. Spoke to several peer institutions about their evaluation experiences. This information was used to help formulate the evaluation process. More details are available in the Institutional Peer review portion of this document.
Sandbox Reviews:	A sandbox, or a blank test course, helped identify specific teaching and learning scenarios and to understand the amount of effort that goes into a task in each LMS. The sandbox reviews helped us prepare for the pilot phase of the project.
Interviews:	Interviews were conducted with fifty faculty members of varying demographic backgrounds and colleges. Those interviewed also represented a wide range of experiences in using Blackboard. Interviews were also performed with key stakeholders from around campus to understand what they require from Cornell's LMS. Information from these interviews is included in this document.
Requirement Workshops:	Workshops were held with Academic Technologies, including their online learning team, and the Center for Teaching Excellence (these groups have since formed the Center for Teaching Innovation). Workshops focused on understanding the specific LMS needs of each group as they related to teaching and learning at Cornell. These

	requirements, along with others, are listed in the requirements comparison portion of this report.
Faculty Survey:	In the Spring of 2017, a survey was sent to all members of the faculty at Cornell. The goal of the survey was to identify faculty's satisfaction level with Blackboard and to identify the current and future LMS needs of Cornell faculty. An analysis of this survey can be found in the next section.
Student Survey:	In the Fall of 2017, a survey was posted on Blackboard for students only. Students could opt in to take the survey, and at the end of the survey sign up to be part of a roundtable discussion. Information on both the roundtable discussion and the student survey results can be found later in this document.
Information Sessions:	To raise awareness and hear feedback, four information sessions were held during the first two weeks of November 2017. Three members of the evaluation team answered questions and provided information about the project. Information sessions were four hours long each and were held in Sage Hall atrium, Duffield Hall passage, Mann Library lobby, and Klarman Hall's Groos Family Atrium.
Round Table Discussions:	Voluntary discussions were held for students and TAs. Each discussion was an hour long and included a maximum of ten individuals. Questions posed during the discussion focused on how students and TAs currently use Blackboard, their experiences, and what they wish they could do in the LMS. Information from the roundtable discussions is included further on in this document.
Pilot Feedback:	A diverse range of faculty, across colleges, disciplines, and experience levels were invited to pilot Blackboard Ultra, Brightspace, and Canvas in the Fall of 2017. Each of the pilot systems had an instructional designer who specialized in assisting faculty throughout the semester. During the pilot, a series of three surveys were completed by faculty. These surveys include a pre-survey, focusing on creating the course. A mid-survey focused on teaching the source. A final survey focused on their overall experience. At the end of the term, faculty sat down with two of the evaluation team members for a 30-minute interview on their pilot experiences. Students in the pilots were also sent a survey and had the option to volunteer for a roundtable discussion. An analysis of the pilot is included in this document.
Technical Reviews:	Each of the LMS solutions being evaluated has their own technical specifications and considerations. A part of the evaluation process included technical, security, and administrative reviews of each LMS. More details on the technical ramifications of each pilot system are included further on in this document under "Technical Analysis".
Observations:	Throughout the process, the evaluation team gathered information observations from faculty and student interactions. This information is woven into the pilot analysis where applicable.

6. Faculty Survey and Interview Analysis

A key component of the evaluation process was to understand faculty's diverse needs and opinions. To achieve this, we surveyed all Cornell teaching faculty and conducted a series of targeted interviews.

6.1. Faculty Survey and Interview Goals

To help assess the current academic needs of Cornell's faculty, a team drawn from the Center for Teaching Innovation and Cornell Information Technologies sought faculty feedback regarding their experience with Cornell's Academic Learning Management System (LMS).

The primary goals of the inquiry were to:

1. Identify what LMS options are being used on campus and the general satisfaction level with those systems.
2. Identify the current and future LMS needs of Cornell faculty members.

The following analysis includes:

- A description of the survey and interview methodology.
- The overall response rate to the survey including survey response demographics.
- An examination of the current Blackboard satisfaction level, with breakdown analysis of colleges and schools, length of service, and appointment type.
- Responses to five specific Blackboard questions
- LMS features and functions faculty would like to see in an LMS.

Each section of the analysis begins with a brief summary, followed by a detailed examination of the survey responses and faculty interviews. Unless otherwise noted, demographic data did not reveal any significant trends; charts for demographic data are available in Appendix A. All other data is displayed in charts below the relevant survey question. The term faculty is used throughout the analysis to describe anyone involved in the instruction of courses at Cornell.

6.2. Faculty Survey Methodology

To address the diverse needs of Cornell faculty, it was important to utilize a survey distribution method that could also provide demographic data. This was accomplished by using the email distribution method available in Qualtrics, an online survey tool, which generates a personalized link for each participant and sends an email including the link.

Using this method, the following demographic data were gathered for each survey response:

- College
- Length of Service
- Appointment Type

Survey questions were crafted to focus on the current Learning Management System (LMS) faculty is using. For example, if a respondent indicated they were using Blackboard the survey

also prompted them to answer a series of five Blackboard specific statements, including whether Cornell should adopt a new LMS. Regardless of what LMS the faculty chose, they were asked questions about what features and functions they would like in an LMS system. If a faculty member indicated that they do not currently use an LMS, they were prompted to select a reason why.

The survey took approximately 10 minutes to complete. Survey questions were optional and included both close-ended and open-ended questions. Responders had the ability to terminate their participation at any time. All survey responses are confidential and are reported in aggregate. A copy of the survey questions can be found in Appendix B.

6.3. Faculty Interview Methodology

Between March and June of 2017, forty-nine structured interviews were completed with faculty members from across the Cornell community. Interviews played an important role in the analysis, as they allowed us to probe beyond the survey questions for deeper levels of insight and context. We identified a broad, representative sample of faculty to interview by reaching out for suggestions from departments across the campus. Some of pilot faculty were nominated by the Associate Deans of their respective colleges. Additional interviews were conducted with people who volunteered and contacted us through the LMS Evaluation website or by writing to us through email. Those interviewed include faculty from across all disciplines, colleges, appointments, lengths of service, gender, Blackboard use levels. Each interview was done face-to-face or video conference with two members of the project team and lasted for 30 minutes. Hand-written notes were taken at each interview along with a recording, which was then transcribed and coded for themes. Coding was done using the program NVivo, where individual nodes were created for specific interview questions, attitudes, features, functions, and other themes as they emerged. Findings from the interviews are included in the analysis below.

6.4. Faculty Survey and Interview Analysis

Summary: A key component of the faculty survey was to hear the voices and opinions of Cornell's diverse faculty. Overall response rate for the survey was 28% of Cornell faculty. Demographic data shows that faculty at various points in their careers, from various colleges and schools, and from various roles, all contributed their thoughts on Cornell's current and future needs for an academic LMS.

In March of 2017, 2,566 faculty members at Cornell (participants were selected by job title and provided by Cornell's HR department, including tenure and tenure-track faculty, teaching faculty, and visiting faculty) were emailed an online survey using the Qualtrics personalized link feature. The survey was initially e-mailed to faculty on March 14th, with a reminder e-mail with a personalized link to the survey was sent on March 28th and April 13th. Reminders were sent only to those who had not completed the survey. The survey was closed on April 17th. During that time, 778 individuals submitted a survey for an overall response rate of **28%** across Cornell colleges and schools (Figure 5-1). The majority of people who responded to the survey indicated they use Blackboard as their LMS (75.71% of participants). Five percent of survey participants selected Canvas, Moodle, or CMS as their LMS. Faculty also had the option to choose "Other"

and to write in what system they are using, which mainly included personal websites or blogs (9% of participants chose "other").

COLLEGE OR SCHOOL	# OF BLACKBOARD	# OF CANVAS	# OF MOODLE	# OF CMS	# OF OTHER	# OF NONE	TOTAL	OUT OF…	% RESPONSE
API	4						4	25	16.00%
CAS	212	2	2	2	29	19	266	772	34.46%
CHE	40	1			1	6	48	146	32.88%
CVM	23	1		2	7	18	51	211	24.17%
GM	22	2	1			1	26	112	23.21%
IP	1				1		2	4	50.00%
LIBR	2		1				3	3	100.00%
SHA	26	4	1		2		33	73	45.21%
GRAND TOTAL	589	12	6	23	68	80	778	2566	

Figure 6-1. Overall faculty survey distribution and response rate

After grouping all responses into the length of service categories, we found that our survey reached faculty at all stages of their career.

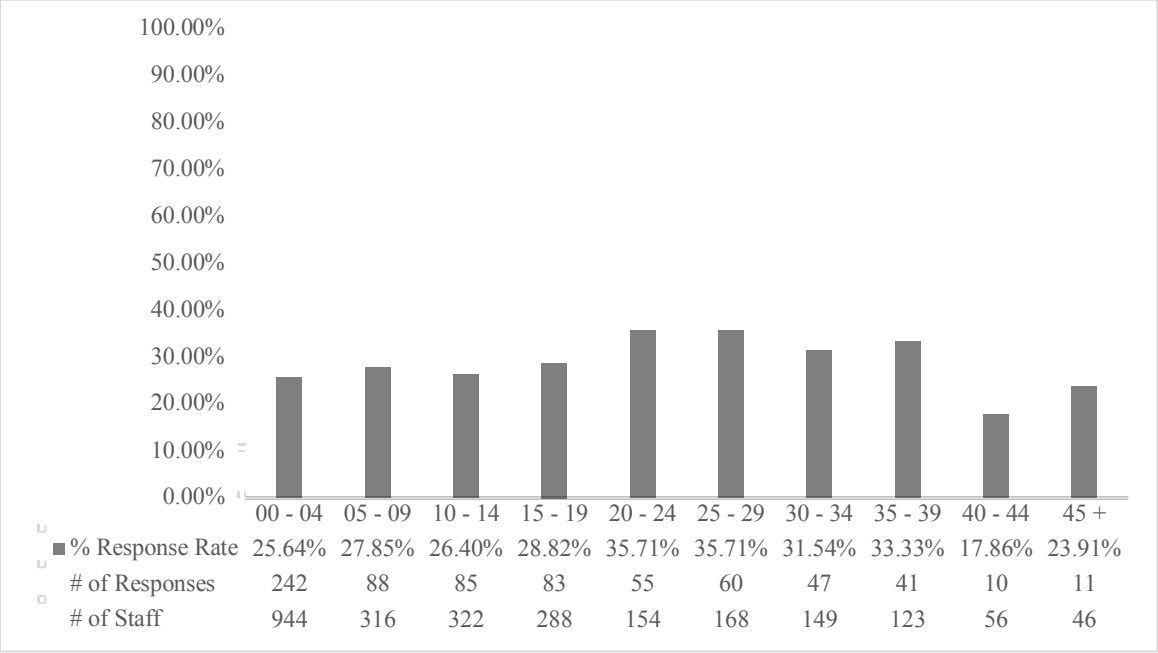
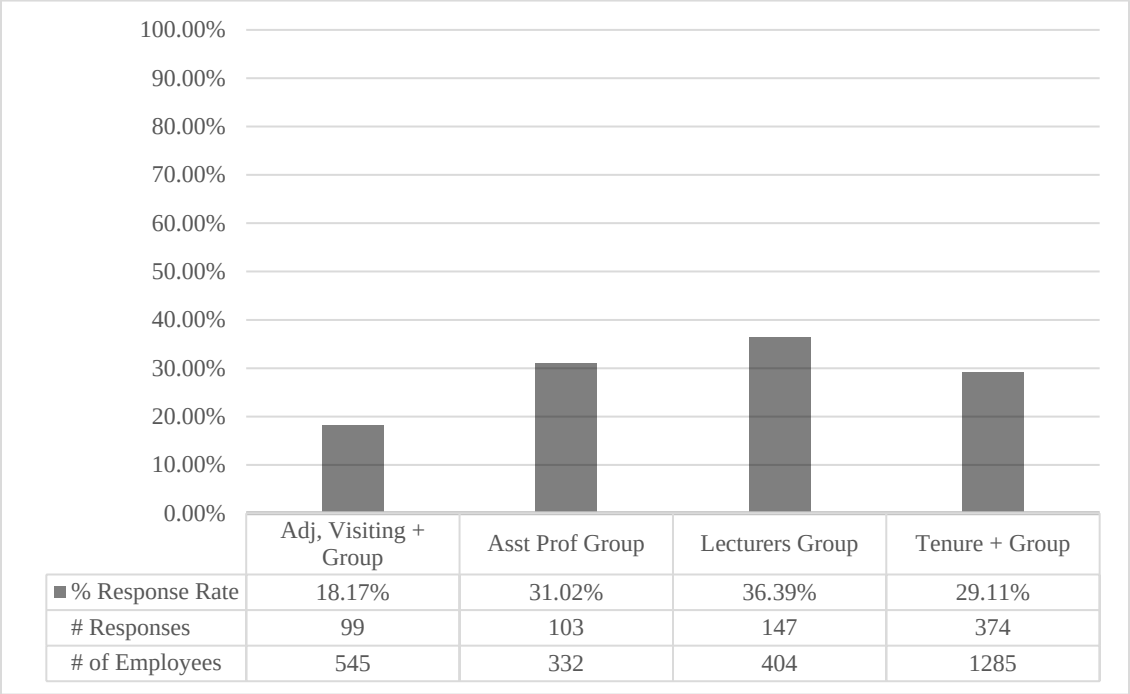


Figure 6-2. Overall faculty survey response rate by length of service (in years) at Cornell

Figure 5-3 (below) depicts the survey response rate by appointment group. The appointment group demographic was chosen so that we could view responses by tenured faculty, lecturers whose job is predominantly teaching, those with temporary or visiting status, and assistant professors. Assistant professors were placed into their own category to identify any potential differences between new faculty and established faculty. A full breakdown of the groups and the appointments included in each can be found in Appendix C.

Out of the four groups defined, the highest response rate is from the Lecturers group (36.39%), followed by the Assistant Professor group (31.02%). Following the Assistant Professor group closely is the Tenure + group (29.11%), with 374 out of 1285 potential Tenure + members responding. The Adjunct and Visiting group is the least represented in the survey (18.17%), with only 99 out of the 545 potential responders completing the survey.



	Adj, Visiting + Group	Asst Prof Group	Lecturers Group	Tenure + Group
% Response Rate	18.17%	31.02%	36.39%	29.11%
# Responses	99	103	147	374
# of Employees	545	332	404	1285

Figure 6-3. Overall faculty survey response rate by appointment group

Forty-four faculty members indicated they were not using Blackboard. They were prompted to include a reason why. We received the following qualitative responses:

- 23 out of 44 responses indicated they are not currently teaching.
- Seven said it was not worth the effort.
- Seven said they did not know either what it was or had not been trained.
- Other participants responded with:
    - "It's not used by the course coordinators"
    - "Was planning to start using in the near future."
    - "Have students that are not at Cornell."

6.5. Blackboard Satisfaction

Summary: Overall, the majority of faculty at Cornell are satisfied with Blackboard. The rest are neutral, with a minority that are dissatisfied. This is true across colleges, school, length of service, or appointment type.

Participants were asked, "How satisfied are you with the learning management system you are currently using?" and given a 5-point Likert scale from "Very satisfied" to "Very dissatisfied" (Figure 5-4). This provides us with a glimpse of Cornell's faculty overall Blackboard satisfaction level.

Seventeen percent (17.35%) of users reported being dissatisfied or very dissatisfied with Blackboard, while 60.2% of users reported being either satisfied or very satisfied with Blackboard. Almost a quarter of faculty who completed the survey (22.25%) report being neutral and are neither satisfied nor dissatisfied with Blackboard.

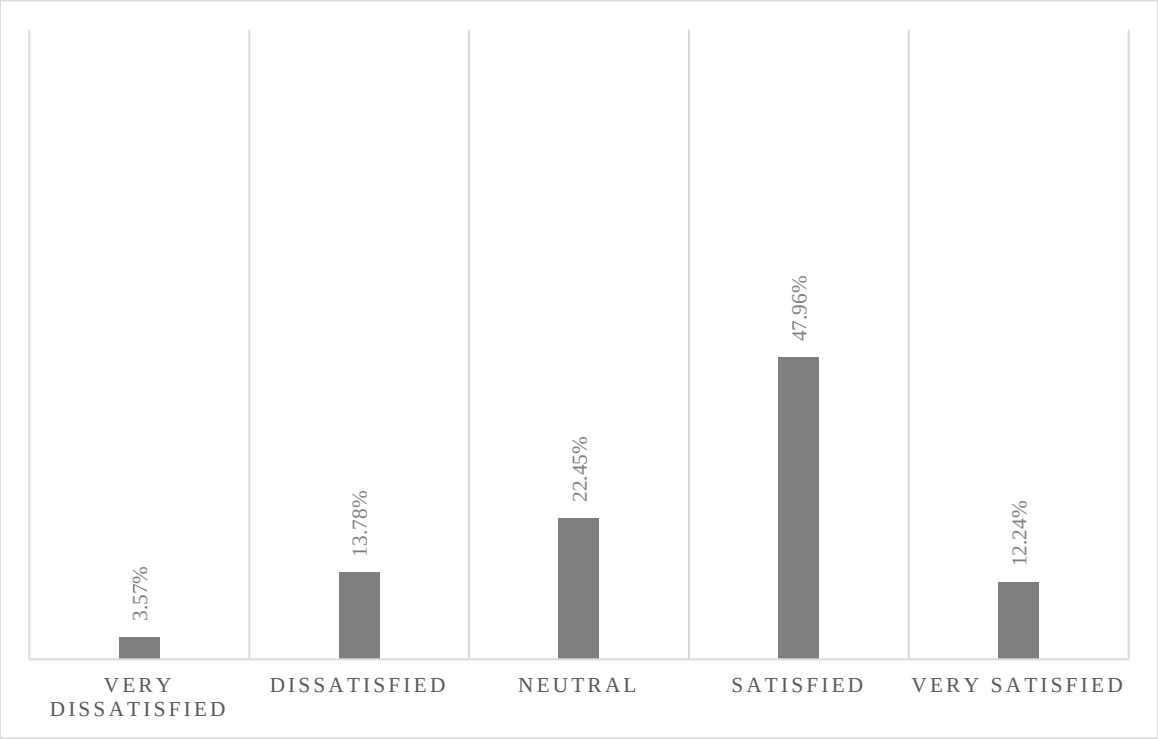


Figure 6-4. Overall Blackboard satisfaction levels from faculty survey

6.6. Blackboard Specific Questions

In order to understand current opinions on Blackboard, we asked participants to respond with how much they agree to a series of five Blackboard statements:

- I like using Blackboard
- Blackboard is easy to use

- Blackboard is meeting my needs
- I want to continue using Blackboard
- I want Cornell to adopt a new learning management system instead of Blackboard

Faculty were provided with a 5-point Likert scale. Choices included strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree. Survey participants were automatically prompted to respond if they had previously indicated they are a user of Blackboard. Responding to each question was optional.

Unless noted, no major differences occurred across different colleges, length of service, or appointment type.

I like Using Blackboard / Blackboard is Easy to Use

Summary: Over 50% of responding faculty indicated that they find Blackboard easy to use (54%) and enjoy using it (56%). Unless noted, no major differences occurred across different colleges, length of service, or appointment type. Interviews with faculty provided additional insight and underscore that though faculty find Blackboard easy to use, they are generally unenthusiastic in their endorsement.

When asked whether they liked using Blackboard, over 56% of faculty either somewhat agreed or agreed. In contrast, only 21.51% of faculty either strongly disagreed or somewhat disagreed. The remaining 21.51% indicated they are neutral. Breaking down the data by college reveals a similar trend to the overall responses.

Breaking down “I like using Blackboard” into appointment groups reveals the start of a trend that is common throughout the majority of the Blackboard specific questions: when compared to the other appointment groups, assistant professors were more neutral than other groups. The assistant professor group responded with an average of 3.06 (on a five-point Likert scale, this is neutral). While the lecturers, tenure, and the adjunct/visiting group scored within a tenth of a point of each other at 3.60, 3.51, and 3.56 respectively.
Similar to “I like using Blackboard”, over 54% of participants report finding Blackboard easy to use. However, 28% of responders disagree, indicating that they find Blackboard difficult to use.

During interviews, we invited faculty to describe how they are currently using Blackboard and to discuss how they feel about using it. Responses ranged from finding some features "incredibly frustrating and non-intuitive" to overall feeling Blackboard is "pretty okay" and "it's not attractive but it works". Several faculty members felt Blackboard was cumbersome, or "kludgy", but functional with some features being too click-intensive. Our conversations with faculty revealed that although Blackboard is not attractive and some functionality is frustrating, it works because they know how to use it now. One faculty member sums this up by saying, "It's gotten easier just because I'm more comfortable with it and have more experience, so I don't have to fight it."

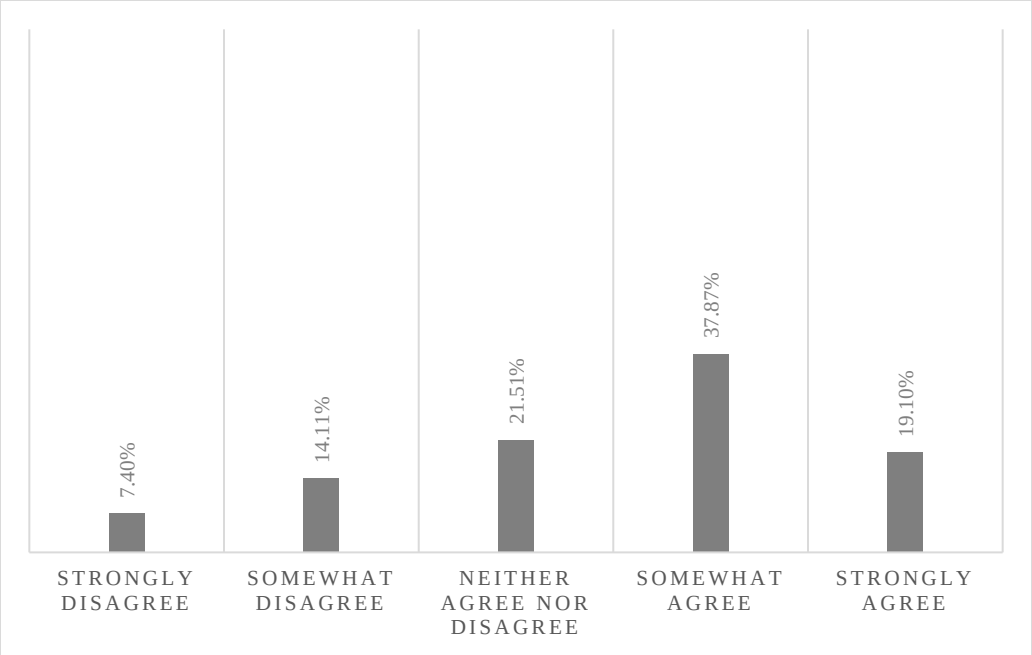


Figure 6-5. I like using Blackboard (All faculty survey responses)

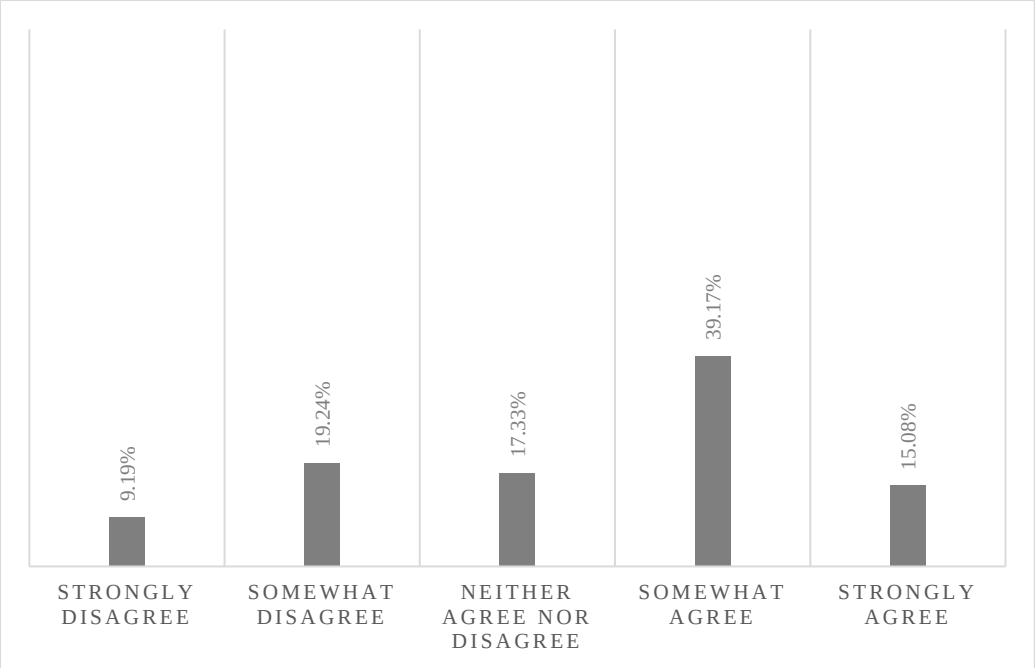


Figure 6-6. Blackboard is easy to use (All faculty survey responses)

Blackboard is Meeting My Needs / I Want to Continue Using Blackboard

Summary: Over 68% of Cornell faculty agree that Blackboard is meeting their needs, and 53.89% want to continue using it. During interviews, faculty report that Blackboard is generally meeting their needs. They find Blackboard to be an "invaluable resource" that provides an online "parallel" version of their class with the ability to communicate, share content, and manage assignments.

When asked whether Blackboard is meeting their needs, over 68% of faculty agreed. Of that 68%, 45.23% of faculty somewhat agreed and 23.40% strongly agreed. In contrast, only 16.12% of faculty disagreed, saying that Blackboard is currently not meeting their needs. The remaining 15.25% of participants neither agreed nor disagreed with the statement.

For the previous Blackboard questions the majority of responses have fallen under "somewhat agree", however, this is not the case for "I want to continue using Blackboard". In this instance, somewhat agree (29.71%) has only a one percent advantage on the neutral response (28.67%). Overall, 53.89% of Faculty agree that they want to continue using Blackboard while only 17.44% disagree.

In interviews, we probed faculty needs by asking what they would miss the most if Cornell, hypothetically, stopped using Blackboard. Answers ranged from having the ability to post different types of content online to peer assessment. The majority of interviewed faculty view having an LMS like Blackboard as an "invaluable resource" that provides a way of communicating with students and disseminating content.

When discussing their use of Blackboard one faculty member summarized by saying,

> *"I think it's enormously helpful. In some way, I sort of think of it as ... It's kind of like a parallel version of the class, and year to year it's great because then I can kind of, I dupe [duplicate] it into the new course, and then things still need to be revised, but it makes my life so much easier having that."*

Additionally, an analysis of our interview notes revealed another recurring trend: faculty described certain features they would like to use but believe to be unavailable in Blackboard. In a number of instances, the desired features are available in Blackboard. This suggests that Blackboard may have more functionality than faculty realize, however, the interface may not be intuitive enough for them to discover features on their own. Occasionally, the feature they want is available in Blackboard but faculty were unable to find it. Usually, this occurs when faculty expect to find a feature or function in a certain location and it is actually located somewhere else. Faculty also discuss a gap between how features are expected to perform and how the feature actually performs. It is important to note that this may not be limited to Blackboard and there is a chance that it will continue to occur even if Cornell migrates to a new LMS. It also highlights the need for support personnel who understand the product well enough to translate what faculty would like to accomplish in their course how that can be achieved in LMS.

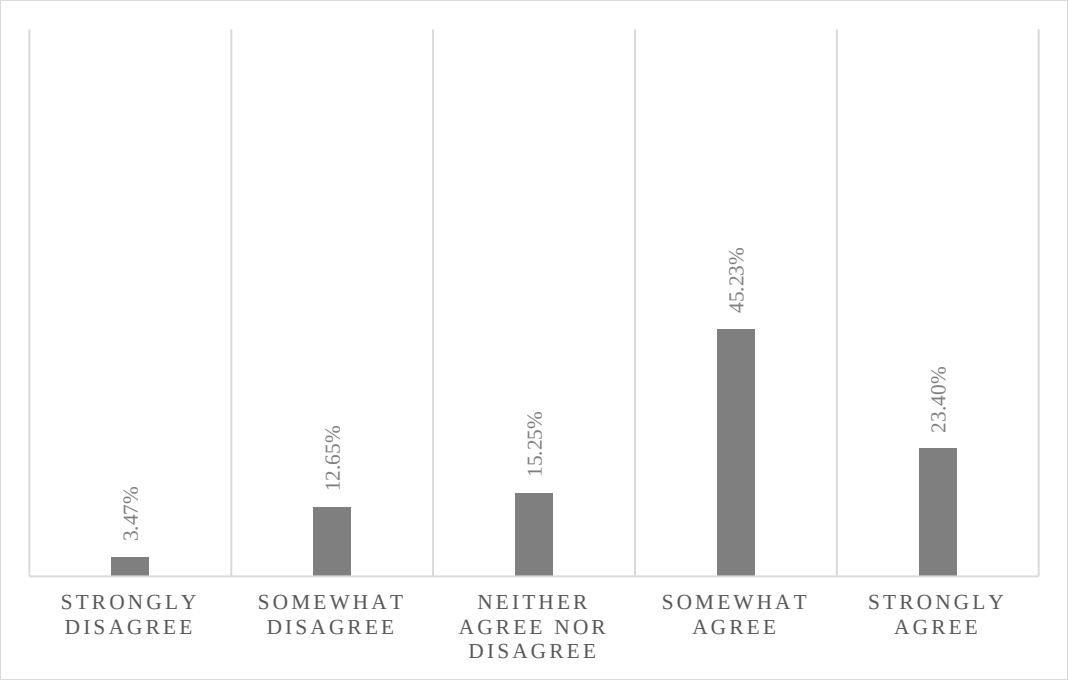


Figure 6-7. Blackboard is meeting my needs (All faculty survey responses)

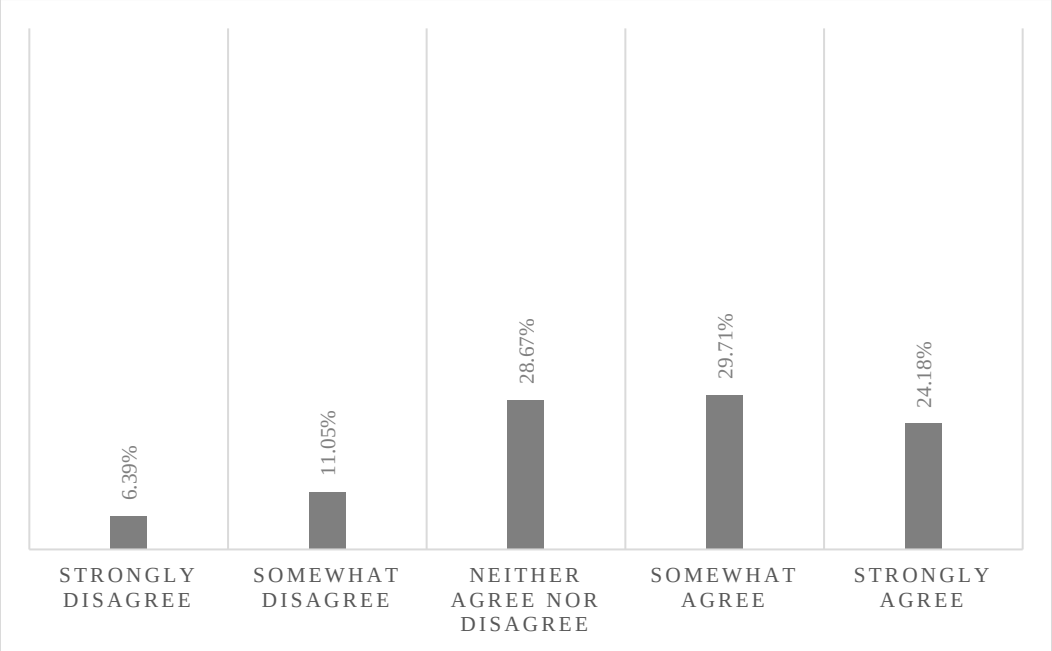


Figure 6-8. I want to continue using Blackboard (All faculty survey responses)

I want Cornell to adopt a new LMS

Summary: When asked whether faculty want a new LMS, the overall response was neutral at 45.75%, with 34.83% of faculty indicating they do not want to switch to a new LMS. This resonates with interviewed faculty, who are curious about a new system but are wary of the value versus the time and effort spent in migrating courses and learning how to use a new LMS. Interviews also point out the need for additional faculty support if Cornell transitions to a new system.

Our final Blackboard question was to ask faculty whether they want Cornell to adopt a new LMS. Up until this point, a majority of faculty have answered every Blackboard question with a clear preference towards finding Blackboard easy to use, that it is meeting their needs and that overall they like using it. However, when asked if they want to adopt a new LMS, 45.75% of faculty responded that they neither agreed nor disagreed. Moreover, 34.83% of faculty responded that they disagreed and do not want to switch to a new LMS. While only 19.42% of faculty agreed, indicating they want to transition to a new system.

When asked why they do not want to switch to a new LMS, forty-five faculty responded and provided the following responses:

- Twenty-three out of forty-five responses said it was not worth the transition.
- Twelve of the forty-five are happy with the current LMS.
- Eight are unaware of what other options are out there.
- Two feel that Cornell switches software too frequently.

In our one-on-one conversations with faculty, we asked how they felt about migrating to another system. The majority of faculty interviewed demonstrated a curiosity about what else is out there, but were wary of the amount of work and re-learning it would take to transition. Faculty also brought up questions about what would be involved in a switch, and many wondered how their content would be affected.

The following excerpts are examples of the common themes we heard during our interviews,

> *“In general, I have not liked Blackboard, but of course, if there's some different version of Blackboard, or frankly, if someone just wants to sit there and hold my hand and explain how everything works, and I'm convinced that what the students will see wouldn't require any hand holding, then I would be open to trying something.”*
>
> *“Oh. Well if there's another tool I would use it. I think it's there and it's universal, so that's why I use it. The intuitive, if you had two of them and one was more intuitive, I would find that to be the best for me, and for the students. This idea that there should be a workflow can be more evident I guess. But, I mean, I get how this works now and I'm using it. And the students, with some training, a very small amount of it, seem to be able to use it.”*
>
> *“It'd have to be much better… If you can make it easier for me, that's good.”*

> *"Particularly because a lot of the people in our department are not so much into learning something new, so getting them to change to something else that requires them to put in the effort to learn something new, it would be best if it was similar, but then again, those people mostly only upload some things. They don't do very much with all the pesky pieces of it."*

Several faculty, both in the interviews and qualitative survey comments, mention variations of, "Blackboard is the only one I've seen basically, really, so it's hard for me to know how others would be much different." The uncertainty of what else is available and whether it is any better than Blackboard may explain some of the neutral responses from the faculty survey.

The interviews also provided some deeper insight into the level of support that faculty would need if Cornell were to transition to a new LMS. Faculty mention not wanting to "repeat it all from scratch" and that their biggest concern would be trying to migrate content (assignments, pdf, syllabus, etc.) over. One faculty member summarizes this by saying, "So to say 'oh I'm going to switch to something that could be maybe better but might not be better and then I'm going to spend a lot of time and effort to switch over' that's daunting. Because I don't really like Blackboard but I know how it works and it is fine." It is clear that, should we transition, faculty want the impact on their time and effort expended to be minimal.

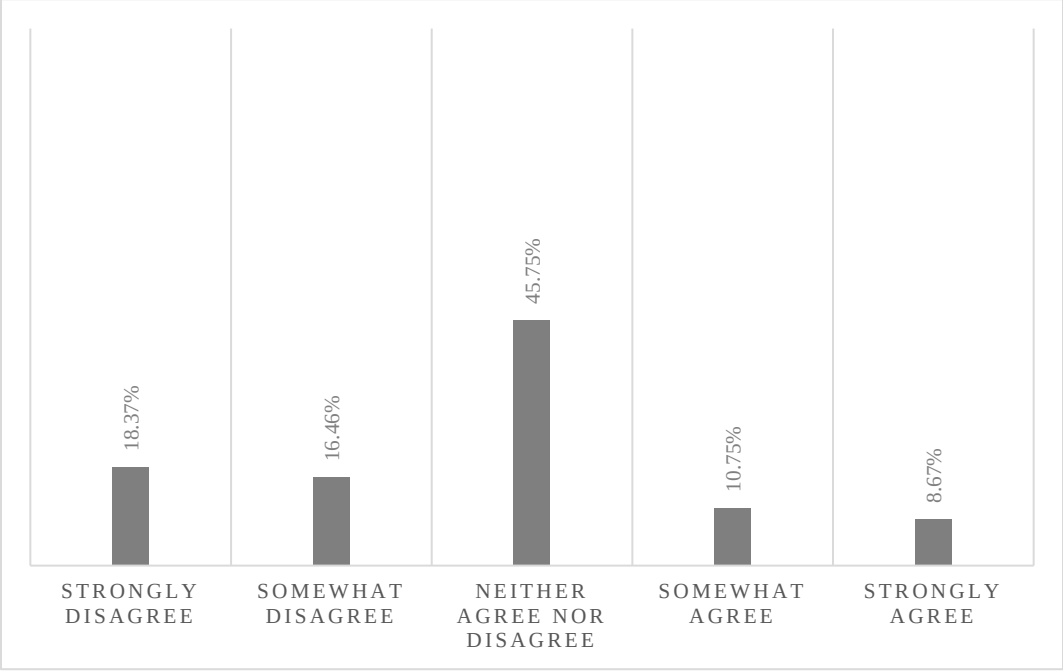


Figure 6-9. I want Cornell to adopt a new LMS (All faculty survey responses)

I would prefer a full feature set over ease of use

Summary: When asked whether they would prefer a LMS heavy with features or easy to use, there is a slight preference (43.96%) towards more features. The qualitative comments left on the survey and comments made during faculty interviews provided us with more insight. Overall, what Cornell faculty want from an LMS can be summarized into two main themes: Faculty want a system that is easy to use and has a clean intuitive interface, while also having the ability to opt-in to the features that fit their diverse needs.

Regardless of what LMS was selected each participant was prompted with the question "I would prefer a full feature set over ease of use". Our goal in asking this question was to discern whether Cornell faculty would prefer an LMS that is full of features but may have a steep learning curve, or if they would prefer a simple LMS that is easy to use but has only bare minimum features. Results indicate that 43.96% of Cornell faculty disagree, indicating they would prefer the ease of use to more features, and 36.95% of faculty neither disagree nor agree. This implies that a slight majority of faculty would prefer more features to ease of use. Additionally, faculty were provided with two lists of features and were asked to identify which they would like to use in their course. More information and a discussion on the results can be found in the requirement section of this document.

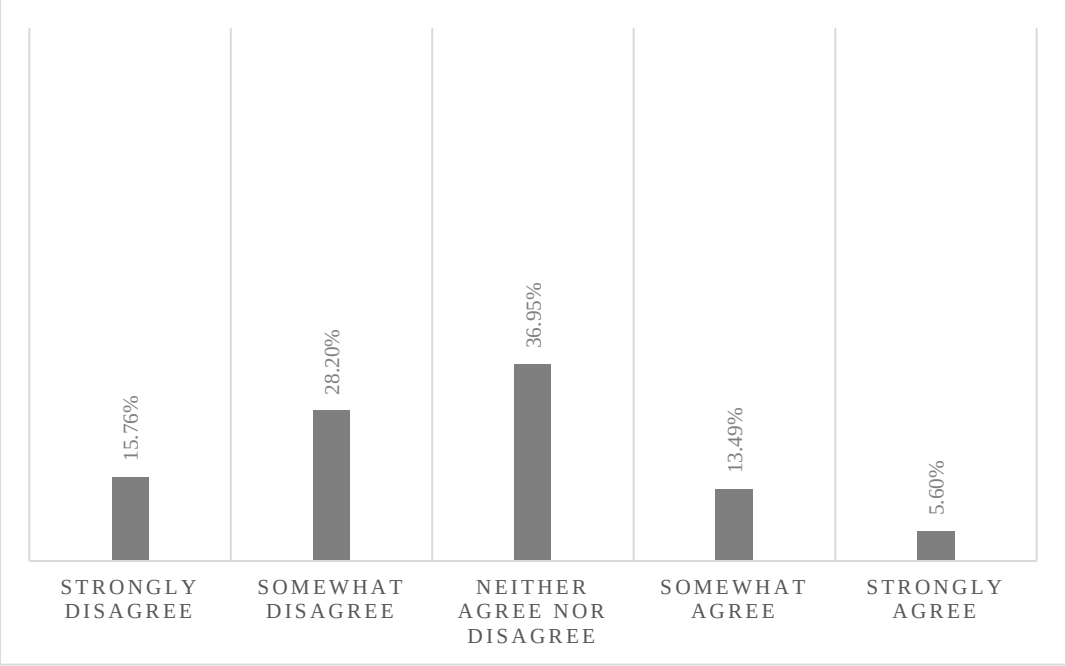


Figure 6-10. I would prefer a full feature set over ease of use (All faculty survey responses)

6.7. Conclusions for the Faculty Survey and Interview Analysis

In conducting the faculty survey and interviews, we had three primary goals: to identify what learning management systems are being used at Cornell, to measure the current satisfaction levels with those systems, and to identify the current and future needs of the Cornell faculty

community. We found the majority of people who responded to the survey indicated they use Blackboard as their LMS (75.71% of participants). Due to the low response rate for the other systems, the analysis focused mainly on Blackboard.

Survey and interviews indicate that faculty are mostly happy with Blackboard with only a minority expressing dissatisfaction in it. However, that happiness is not especially deep or profound (around half of those who responded said they enjoy using Blackboard and that it is easy to use). Those who participated also generally agreed that Blackboard is meeting their needs (68%) and they want to continue using it (54%). Overall, Cornell faculty are happy with Blackboard but are also open to something new if it is an improvement over Blackboard (45% have no opinion on whether Cornell should adopt a new LMS or stay with Blackboard).

Through our survey and interviews, we uncovered a diverse range of needs and opinions from Cornell faculty. When we try to summarize these differing points of view, we are left with two main themes:

The first is the desire for a clean and intuitive interface, as demonstrated in some of the comments below:

> *"I realize that this is not quite what we think of as a feature, but ease of use is, for me. I spend substantial time fighting to get Blackboard do some semblance of what I want to do."*
>
> *"…Blackboard functionality is adequate for my needs, has more than I really want, but looks and feels out-of-date and clunky to use, particularly when moving folders/building content. Would like to see a system that conforms better to modern student online expectations."*
>
> *"The problem with Blackboard is not the features offered, but ease of use. I should not have to look up how to do simple things. Instructions should be logical and clear. I should be able to drop and drag. I should not have to go through multiple steps to do simple things."*

The second theme that emerged is the desire to have a variety of tools available. However, faculty also want to have the ability to opt-in to those features, instead of having all of them turned on at once.

> *"I use Blackboard for an organization--for writing walk-in service tutors; so, I would LOVE some sort of scheduling infrastructure!"*
>
> *"Better presentation of media integrated with scaffolding/practice."*
>
> *"Home page that's personal to the course, easy modification of templates, learning modules that make sense."*
>
> *"An efficient way for students to organize and annotate collections of visual research"*

> *"Blackboard requires certain activities (e.g. points must be assigned for final grade calculation even though I don't use that feature, but there are many others). I want opt-out on virtually everything."*

Essentially, faculty comments reveal they want an un-cluttered intuitive experience where they can easily find and opt-in to features they want to use. This is supported by interview conversations where faculty highlight the overall usefulness of Blackboard, but also feel unenthusiastic about the system's click-intensive and outdated "kludgy" interface. Overall, survey and interview analysis reviews that Cornell faculty are relatively satisfied with Blackboard, yet are open to moving to a new system if it provides a better user interface, flexibility in features, and can be done with minimal impact to their daily life.

7. Student Blackboard Poll and Round Table Analysis

To understand the needs and experiences of Cornell's student users of Blackboard, we gave every student logging into Blackboard, for a month during the fall semester of 2017, the opportunity to be surveyed. We also conducted a series of roundtable discussions and public information sessions.

7.1. Student Blackboard Poll and Round Table Goals

To help assess the current academic needs of Cornell's students, a team drawn from the Center for Teaching Innovation and Cornell Information Technologies sought student feedback regarding their experience with Cornell's Academic Learning Management System (LMS).

The primary goals of the inquiry were to:

1. Identify what LMS options are being used on campus and the general satisfaction level with those systems.
2. Identify the current and future LMS needs of Cornell student Blackboard users.

The following analysis includes:

- A description of the survey and interview methodology
- An examination of the current Blackboard satisfaction level
- Responses to five specific Blackboard questions
- LMS features and functions students would like to see in an LMS

Each section of the analysis begins with a brief summary, followed by a detailed examination of the survey responses and feedback from roundtable discussions and information sessions. All data is displayed in charts below the relevant survey question.

7.2. Student Blackboard Poll Methodology

Survey questions were crafted to focus on the current Learning Management System (LMS) students are using. For example, if a respondent indicated they were using Blackboard the survey also prompted them to answer a series of five Blackboard specific statements, including whether Cornell should adopt a new LMS. Regardless of what LMS the students chose, students were also asked three additional qualitative questions. Those questions focused on suggestions they had for faculty to improve their courses, what features they wish they had in their LMS, and what component of an LMS best contributed to their learning. These qualitative questions were inspired by a preliminary roundtable discussion, where students repeatedly discussed how Faculty uses Blackboard in addition to the system's features. At the end of the survey, students were also given the option to sign up for a roundtable discussion.

The survey took approximately five minutes to complete. Survey questions were optional and included both close-ended and open-ended questions. Responders had the ability to terminate their participation at any time. All survey responses are confidential and are reported in aggregate. A copy of the survey questions can be found in Appendix D.

7.3. Student Round Table and Information Session Methodology

In mid-May and mid-November of 2017, four structured roundtable discussions were completed with students from across the Cornell community. The first roundtable discussion was held in the Hans Bethe House, which included ten students from across different colleges and majors. An additional three roundtables were held in November with students who volunteered through the Blackboard student survey. Students ranged across all disciplines, colleges, and Blackboard use levels. Each roundtable was done face-to-face with two members of the project team and lasted for one hour. It is important to note that students who signed up for the roundtable discussions were motivated to participate and share their opinions on Blackboard. These students often shared stronger opinions (both positive and negative) than students who provided feedback another way.

In early November of 2017, four information sessions were held across campus. These information sessions were open to the public, with the goal of spreading awareness about the evaluation project and gathering informal feedback. Sessions were four hours each and located in the lobby of Mann library, the Groos Family Atrium of Klarman Hall, the main atrium in Sage Hall, and across from the workday table in Duffield Hall. One hundred and twenty people stopped by during the information sessions; the majority of them were students (n=103). Detailed notes were taken during each of the information sessions. This feedback, along with feedback from the roundtables are woven into the analysis below.

7.4. Student Blackboard Poll and Roundtable Analysis

Summary: A key component of the faculty survey was to hear the voices and opinions of Cornell's diverse student population. In October and November of 2017, any student logging into Blackboard was given the option to take part in a brief survey. Eight hundred and sixty-five students responded to the survey during that time.

In October of 2017, a blue banner was added to the top of the Blackboard login page. This was visible only to students who were logging into Blackboard. It was first made available on October 25th and was removed on the morning of November 27th. During this time, 925 students opened the link, 865 completed at least one question, and 683 followed the survey through to completion. In addition to the 865 Blackboard users, students indicated that in the past they have also used Canvas (n=160), Computer Science Course Management System (CMS) (n=175), Moodle (n=129). One hundred and nine students mention using other systems like Schoology, Piazza, Sakai, School Loop, and Google Classroom.

7.5. Blackboard Satisfaction

Summary: Overall, the majority of students at Cornell are satisfied (60.68%) with Blackboard.

Participants were asked, "How satisfied are you with the learning management system you are currently using?" and given a 5-point Likert scale from "Very satisfied" to "Very dissatisfied". The majority of students (60.68%) responding to the question indicated that they are satisfied

using Blackboard (Figure 6-1). Additionally, 19.92% of students report being either dissatisfied or very dissatisfied. The remaining students (19.40%) are neutral and are neither satisfied nor dissatisfied with Blackboard.

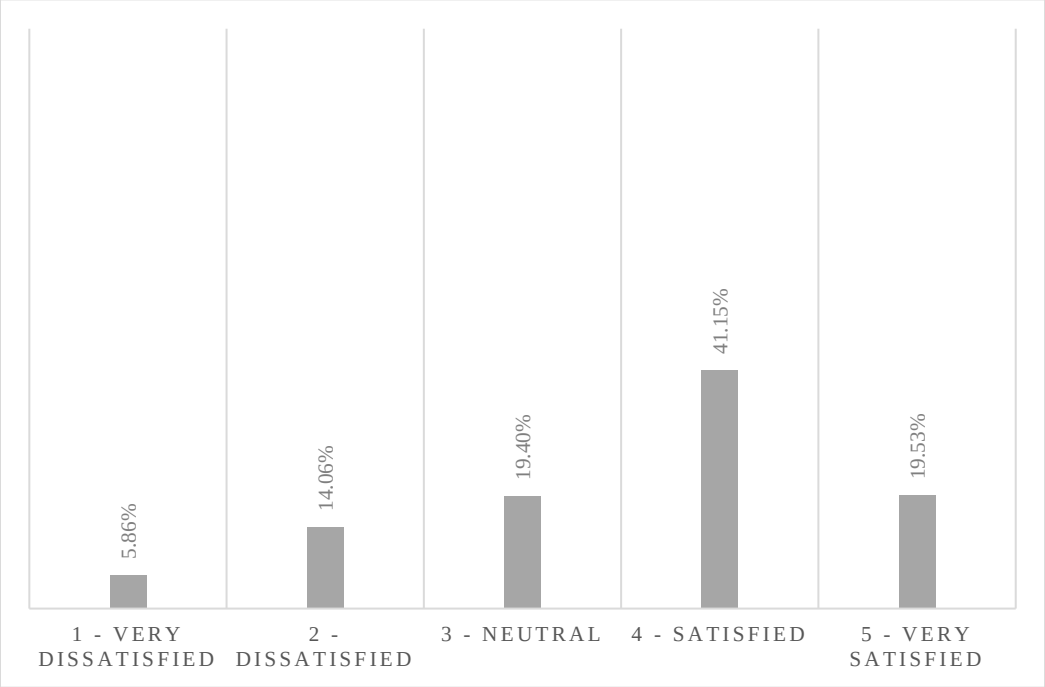


Figure 7-1. Overall Blackboard satisfaction levels from student survey

7.6. Blackboard Specific Questions

In order to understand current opinions on Blackboard, we asked students a series of five Blackboard statements:

- I like using Blackboard
- Blackboard is easy to use
- Blackboard is meeting my needs
- I want to continue using Blackboard
- I want Cornell to adopt a new learning management system instead of Blackboard

Students were provided with a 5-point Likert scale, ranging from “strongly agree” to “strongly disagree”. Survey participants were automatically prompted to respond if they had previously indicated they are a user of Blackboard. Responding to each question was optional.

I like Using Blackboard / Blackboard is Easy to Use

Summary: 65.74% of responding students indicated that they find Blackboard easy to use and enjoy using it (62.81%). Although the majority feel it is easy to use and enjoy using Blackboard, in conversations with students, they identify aspects of the system that, if improved, would raise their level of satisfaction. Some of those improvements include: the mobile app, user interface, and how faculty use Blackboard.

When asked if they like using Blackboard, 62.81% of students either somewhat agreed or agreed while only 20.47% of students somewhat disagreed or strongly disagreed. The remaining 16.71% were neutral (Figure 6-2). Moreover, 65.74% of students report finding Blackboard easy to use. Almost a quarter (22.70%) of responders disagree, indicating that they find Blackboard difficult to use (Figure 6-3). This was also heard in the qualitative responses of the survey along with the round tables and information sessions. Students frequently commented that although Blackboard was frustrating in one or two aspects, overall it is easy to use. For example, one student commented, “The app occasionally experiences bugs, but overall, Blackboard is easy and efficient to use.” Another said, “It isn’t the most user-friendly website making it hard to navigate at first.”

The student survey also asked, “If you had a suggestion for faculty on how to make their Blackboard course better, what would it be?” (This question was added to the survey after a preliminary roundtable identified faculty usage as an area of discussion). The most common response to this question was for faculty to “organize more clearly”. One student summarized this by saying, “Clearly organize documents or resources. Most of my professors never bother, but students can spend hours on Blackboard each week, so it makes a difference.” Another said, “It would be nice if faculty could agree to organize their content in similar manners. It's hard when some people put it in a content folder, and other people put it in a course info folder, and other people put it in an assignments folder. Please be consistent.”

Additionally, students suggest that faculty “post grades more consistently”. Another student said, “If they're going to have a Blackboard site, it would be helpful if they also posted the grades to it so I could better see how I was doing in those classes. A lot of professors just use the minimal functions and it would be nice if they would fully use the site.”

Overall, in conversations with students, they identified one of the biggest difficulties in using and enjoying Blackboard stems from how professors structure courses. This was also heard in the student survey. For instance, one student said that the “format across classes is not uniform and is confusing, making simply getting course information difficult.” Another echoed this feedback, “Needs a more standard, simpler form for professors, some put documents in random places or set things up in an illogical way because they're confused and don't understand how to make their Blackboard page.” In roundtable discussions, this feedback was also heard. Students described Blackboard as being convenient but it depends on how the professor and the teaching team uses it. Students appreciate when it feels like faculty took the time to organize course materials into meaningful folders by using a clear and logical content structure.

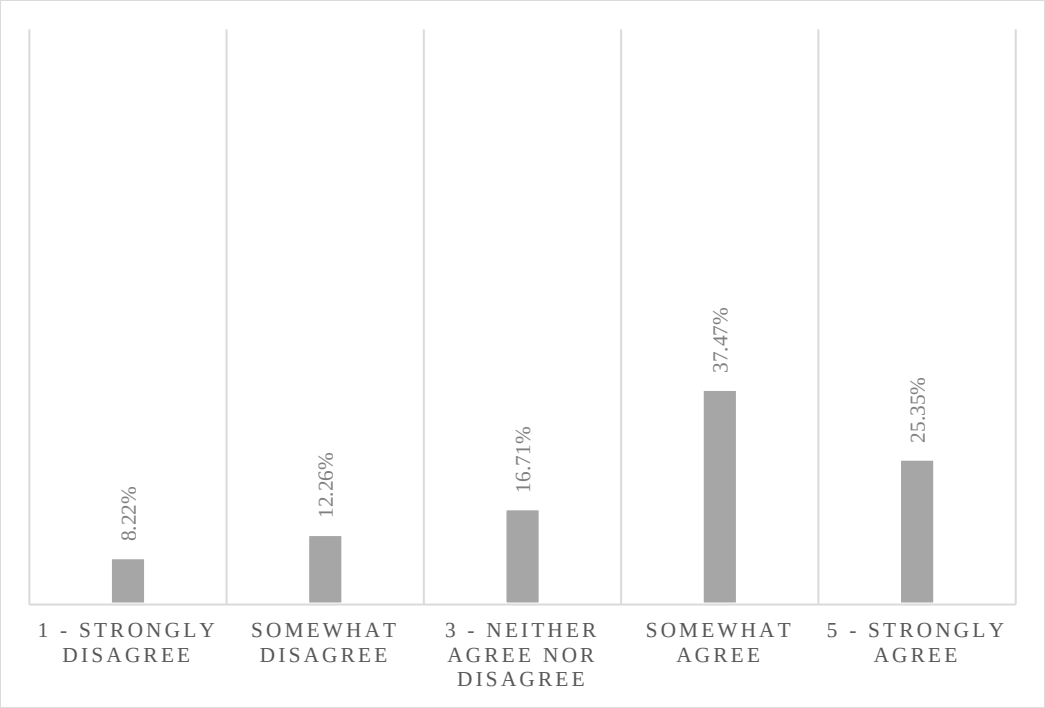


Figure 7-2. I like using Blackboard (All student survey responses)

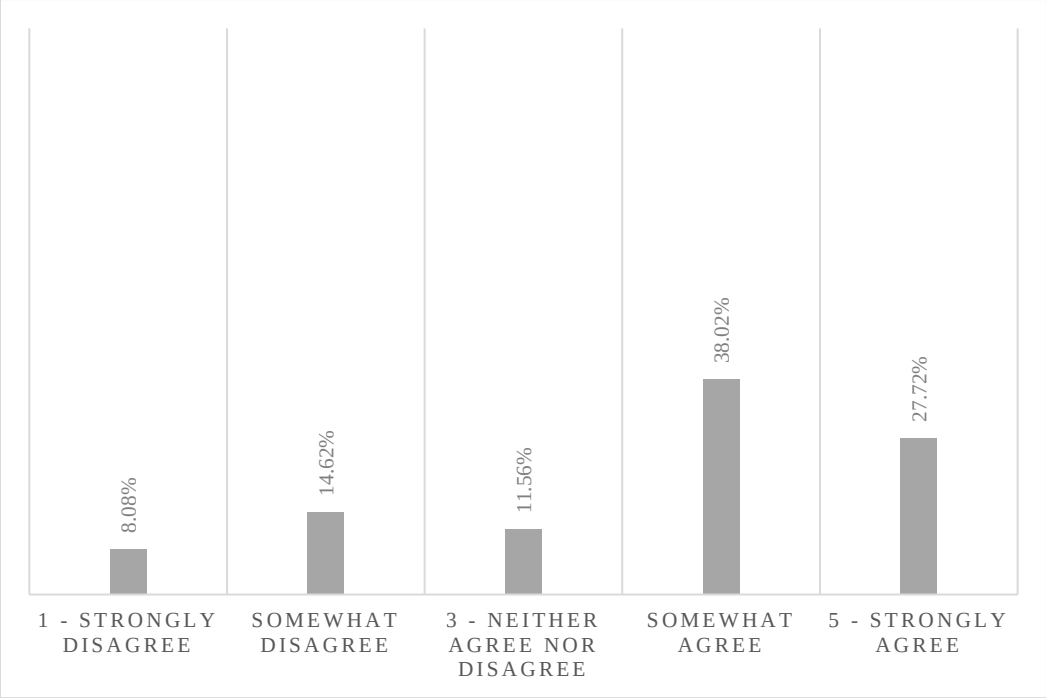


Figure 7-3. Blackboard is easy to use (All student survey responses)

Blackboard is Meeting My Needs / I Want to Continue Using Blackboard

Summary: Over 70% of Cornell students agree that Blackboard is meeting their needs (71.65%), and 59.41% want to continue using it. During round table discussions, students shared that Blackboard is meeting their needs but also cite a few features they wish they had (mainly a functioning mobile application).

When asked whether Blackboard is meeting their needs, 71.65% of students agreed. Of that 71.65%, 40.78% of students somewhat agreed and 30.87% strongly agreed. In contrast, only 16.62% of students disagreed, saying that Blackboard is currently not meeting their needs. The remaining 11.73% of participants neither agreed nor disagreed with the statement (Figure 6-4). Students were also asked to discuss any features or functions that they currently do not have but would like. Many cited the mobile application as being the most desired feature, which is currently available to students but many find it to be inadequate. Blackboard has recently made substantial changes to their mobile application, though the students we spoke with were largely unaware of those changes.

For the previous Blackboard questions the majority of responses have fallen under “somewhat agree”, however, this is not the case for “I want to continue using Blackboard”. In this instance, the “strongly agree” response (30.96%) takes the lead over “somewhat agree” (28.45%). Overall, 59.41% of students agree that they want to continue using Blackboard while only 19.11% disagree (Figure 6-5).

In roundtable discussions, we probed students’ needs by asking what they would miss the most if Cornell, hypothetically, stopped using Blackboard. Answers focused on being able to view grades, turn in assignments, and access content. Having access to their grades was feedback we heard consistently through roundtables and information sessions. Students frequently discussed wishing that grades were always put on Blackboard, with several suggesting that it be mandatory for instructors to use the Blackboard grade book. Additionally, students commented that they like being able to turn in assignments through Blackboard, but wish they had a calendar feature so they could see when upcoming assignments were due. Students in roundtable discussions also highlighted how helpful it is to have easy access to their instructor’s material and the ability access it from anywhere.

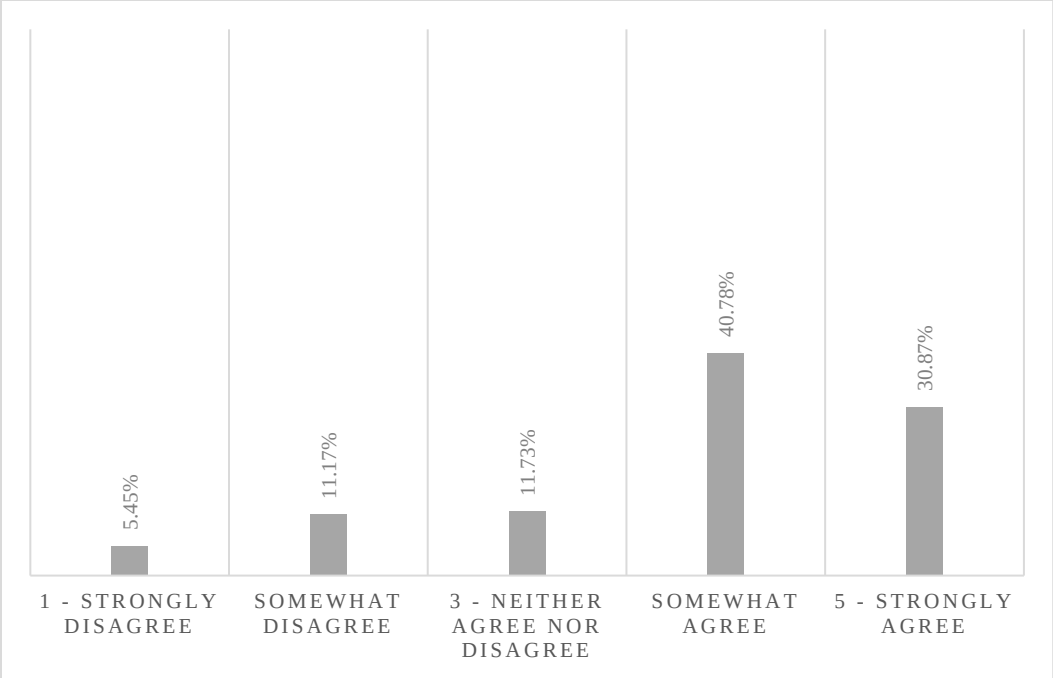


Figure 7-4. Blackboard is meeting my needs (All student survey responses)

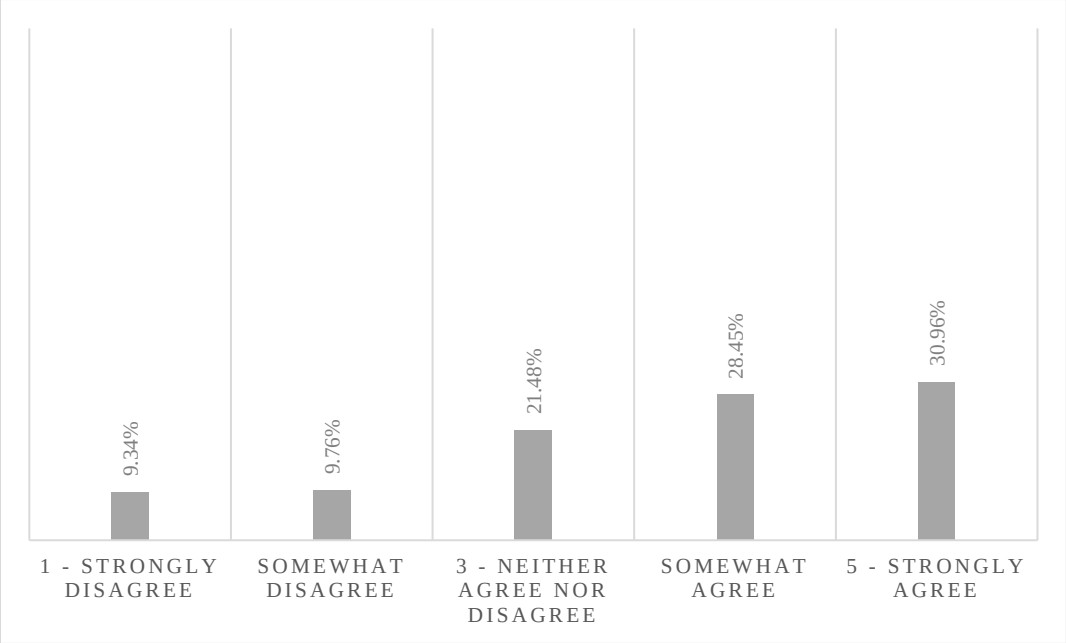


Figure 7-5. I want to continue using Blackboard (All student survey responses)

I want Cornell to adopt a new LMS

Summary: When asked whether students want a new LMS, the majority response was neutral at 39.17%, with 33.06% of students indicating they do not want to switch to a new LMS. This resonates with students we spoke with in round table discussions and information sessions who said that it would not be difficult to learn a new system if they had to, but want whatever system Cornell uses to be easy for them and for faculty.

Our final Blackboard question was to ask students whether they want Cornell to adopt a new LMS. Up until this point, a majority of students have answered every Blackboard question with a clear preference towards finding Blackboard easy to use, that it is meeting their needs and that overall they like using it. However, when asked if they want to adopt a new LMS, 39.17% of students responded that they neither agreed nor disagreed. In addition, 33.06% of students responded that they disagreed and do not want to switch to a new LMS. The remaining 27.78% of students agreed, indicating they want to transition to a new system (Figure 6-6).

Students who responded and said they do not want to switch to a new LMS were prompted to give qualitative feedback. The most common three reasons are:

- Blackboard is meeting their needs
- It would be too much effort and confusion to switch (for both them and instructors)
- They are used to Blackboard

In our information sessions with students, the majority were neutral and commented that while Blackboard is “alright” they are open to trying another system as long as it is easy for them and their instructors. Similar to the faculty’s response, students also indicated they would be open to using something else if it improved upon current features. For instance, they would be interested in switching if the new system gives them access to a calendar or integrates with the Google Docs suite. Conversations in the roundtable discussions were not as neutral, as students discussed their frustrations with Blackboard and a desire to use a system with updated features and user interface.

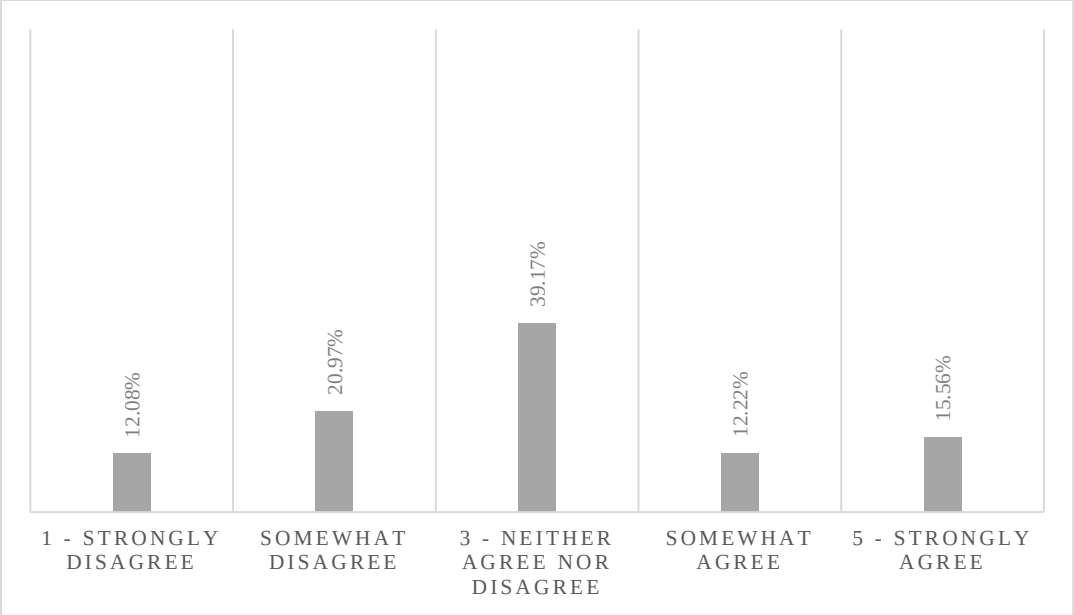


Figure 7-6. I want Cornell to adopt something else instead of Blackboard (All student survey responses)

I would prefer a full feature set over ease of use

Summary: When asked whether they would prefer a LMS heavy with features or easy to use, there is a preference (49.93%) towards more features. Students were also asked to rate specific features of Blackboard. They scored most features positively, with the exception of the mobile application. This was not a surprise, as many of the qualitative comments from students focus on their displeasure with the mobile applications functionality and usability. Blackboard has recently made substantial changes to their mobile application, though the students we spoke with were largely unaware of those changes. Student feedback also shows that students are unhappy with the notification settings in Blackboard, but similar to the mobile application update, were unaware they could customize their notification preferences.

Regardless of what LMS was selected each participant was prompted with the question “I would prefer a full feature set over ease of use”. Our goal in asking this question was to discern whether Cornell students would prefer an LMS that is full of features but may have a steep learning curve, or if they would prefer a simple LMS that is easy to use but has only bare minimum features. Results show that 49.93% of Cornell students disagree, indicating they would prefer ease of use to more features, while 28.79% of students neither disagree nor agree (Figure 6-7).

Students were also provided with a list of features and were asked to identify their current satisfaction level with those features (Figure 6-8). Overall, students are satisfied with the basic functionality of Blackboard with one major exception: the mobile app. Dissatisfaction with Blackboard’s mobile app resonates throughout every method of student feedback. In roundtable discussions, they talked at length about how the mobile app is “clunky” and does not work as they expect. Students expect the mobile app to provide an easy way of view content, announcements, and checking grades. Details from the information sessions were mixed. Some said the Blackboard application does not work at all on certain devices, others said it does but

tries to do too much, and others say it does too little. Students also comment that they wish the website was more mobile responsive so they do not have to rely on the mobile application. In the student survey, students frequently used the qualitative feedback boxes to express their displeasure with its lack of functionality. A few weeks prior to the information sessions, Blackboard released a major overhaul of the application, introducing an updated user interface and functionality. Yet, we found that when asked if they had tried the new version of the app the majority of students did not realize a new version had been released.

In the survey, information sessions, and roundtable discussions, students frequently discussed how and when they receive notifications (via e-mail) from Blackboard. Notifications seem to be a common frustration with students, but one without a consensus on a solution. For instance, some students say they never receive notifications, while others say they receive too many and only want notifications about grades. Some want to see a full stream of activity, while others say they want to see notifications split out by courses. The conflicting desires suggest that students need a system with extensive notification personalization options. It should be noted that students currently have the option in Blackboard to change their notification preferences. However, throughout our conversations, we found that students were unaware of this option.

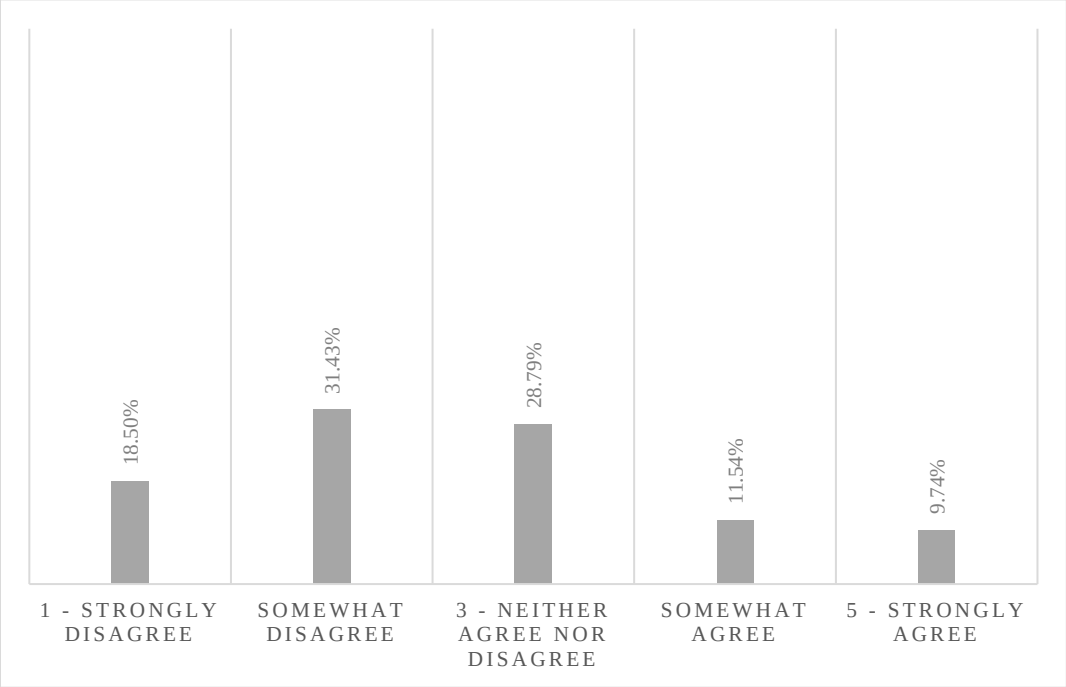


Figure 7-7. I would prefer a system with lots of features over ease of use (All student survey responses)

Blackboard Experience Rating	1 - Extremely bad	2 - Somewhat bad	3 - Neither good nor bad	4 - Somewhat good	5 - Extremely good	I have not done this
Navigating Blackboard	7.77%	17.41%	12.81%	**38.42%**	23.60%	0.00%
Using Blackboard on a mobile device	**33.91%**	21.12%	11.06%	13.36%	9.20%	11.35%

Accessing content in Blackboard	3.74%	12.66%	16.12%	**41.58%**	25.76%	0.14%
Accessing announcements	6.33%	13.96%	15.54%	**33.96%**	29.78%	0.43%
Submitting assignments	5.03%	8.91%	16.38%	**31.90**%	28.30%	9.48%
Checking grades/progress	10.20%	16.81%	16.95%	**31.03%**	23.28%	1.72%
Other	*19.51%*	*7.32%*	*25.61%*	*15.85%*	*15.85%*	*15.85%*

Figure 7-8. Blackboard feature ratings (All student survey responses)

7.7. Conclusions for the Student Blackboard Poll and Roundtable

In conducting the student survey, roundtable discussions, and information sessions, we had two primary goals: to measure the current satisfaction levels with Blackboard and to identify the current and future needs of the Cornell student community. We found the majority of people who responded to the survey indicated they use Blackboard as their LMS (due to the low response rate for the other systems, the analysis focused on Blackboard).

Survey and interviews indicate that students are, for the most part, satisfied with Blackboard but open to trying out a new system if it is an improvement of their experience. Those who participated also generally agreed that Blackboard is meeting their needs (71.65%) and they want to continue using it (59.41%). Overall, 39.17% of Cornell students have no opinion on whether Cornell should adopt a new LMS or stay with Blackboard, while 33.5% feel we should stay with Blackboard and 27.78% would like Cornell to adopt another system.

In addition to measures of overall satisfaction with Blackboard, through surveys and discussions we learned what is important to students:

Mobile. Students expect to have access to course content, including the syllabus, media, and readings, from their mobile devices. They also expect to have easy and consistent access to grades and course announcements. This information should be readily available via mobile application or by a mobile responsive website, preferably by both.

Grades. Throughout all of our feedback methods, students discussed their desire to see grades throughout the semester in a consistent and timely fashion. They explained that some instructors use the grade book throughout the term, some wait until the end of the semester, and others do not use it at all. Ideally, their courses would all update Blackboard with their grades as assignments are graded.

Notifications. Although Blackboard offers students the ability to manage their notifications, in our experience, few students were aware that option was available. There was no single preference for how and what type of notifications students receive. Feedback indicates a clear need for notifications to be flexible with a variety of personalization options. Some students felt they were getting too many notifications, while others felt they were getting too little.

Consistency. How Blackboard is utilized, not the system itself, can be a barrier to student satisfaction. Throughout every method of feedback, students discussed the negative effect of inconsistent course structures and instructor usage. For example, one student cited how

frustrating a course was that had over 100 documents in a single folder and none of it alphabetized. Another spoke of a course that had multiple documents uploaded in multiple places, and never where the students thought it would be. Inconsistency in courses causes headaches and confusion for students and can have an effect on their overall experience in the course.

Overall, student comments indicate that they would be open to transitioning to a new system. As we evaluate Blackboard and alternative systems, we must consider whether change or not, how can we alleviate some of the issues identified by students.

8. Pilot Analysis

In the fall semester of 2017, the LMS evaluation team in conjunction with 26 volunteer faculty members and 1,712 of their students piloted three different learning management systems (LMS). These systems, Ultra by Blackboard, Canvas by Instructure, and Brightspace by Desire2Learn, were chosen based on research into the LMS market and peer institutions. This pilot provided an adequate representative sample of Cornell's faculty across colleges, disciplines, and LMS experience.

The goals of the pilot semester were to:

1. Evaluate the effect of migrating to a new system on the students and faculty.
2. Gather feedback from faculty and students around their experiences in the pilot system.
3. Test each system across a range of use cases, from minimal LMS use to advance feature usage.

This analysis focuses mainly on the pilot semester from a student and faculty standpoint. More information, such as an in-depth analysis of the technical implications, can be found in the technical analysis section of the report.

The following analysis report includes:

- About the pilot systems
- Recruiting for the pilots
- How the pilot was supported
- Faculty survey and interview results
- Student survey results
- A review of the pilot systems from the instructional design and support perspective
- A summary of our vendor relationships
- Overall impressions of each pilot system

8.1. Pilot Systems

Specific information related to Brightspace and Canvas can be found in the Market Analysis portion of this final evaluation report.

The Ultra Experience is a design overhaul for Blackboard that has been slowly rolled out over the past several years. For example, Blackboard Collaborate and the Blackboard mobile application use the Ultra Experience.

On the surface, the most significant change brought by the Blackboard Ultra Experience is an updated user interface. With the Ultra Experience, however, instructors have an option to use traditional or the new Ultra course experience. The Ultra course experience has a completely overhauled the interface and workflow; at this time it has only a subset of core features compared to what is available in traditional Blackboard – uploading content, collecting assignments, online quizzing, facilitating discussions. Faculty may find that the Ultra view provides them with

everything they need and is easier to use and understand. We hoped to test whether this easier-to-use interface was effective and whether it encouraged faculty to greater use.

In preparation for the fall pilot semester, we ran a small pilot (one course) in each system over the summer. During that time, we discovered that the new streamlined Ultra view was not completely ready for live courses. As a result, our Blackboard pilot courses used the original view of Blackboard. This meant that our Blackboard Ultra pilot population did not experience much difference between their pilot courses and their previous use of Blackboard. Essentially, faculty using the Ultra pilot system were working with the same Blackboard system with a new modern interface.

In the future, if Cornell were to continue using Blackboard and switch to Ultra, we would have the option of turning on the Ultra Experience and then allowing faculty to choose between the original view of Blackboard (updated interface with all the features) and the Ultra view of Blackboard (streamlined interface with simpler workflow and functionality). This would require students to navigate two different Blackboard interfaces, depending on their courses.

8.2. Recruiting for the Pilot

Recruiting for the pilot began in March of 2017. Our goal was to have 10 faculty members in each pilot system, for a total of 30 faculty piloting alternative LMSs. This ensured that we would have a sample representative of Cornell's various colleges and disciplines, while also being a feasible number of faculty to recruit. We also recruited faculty at various levels of LMS usage, including those who were heavy users of many Blackboard features, those who used Blackboard for basic features of content distribution, and those who did not use Blackboard at all.

Once a faculty member agreed to participant in the pilot, two members of the evaluation team met with them for an initial 30-minute interview. The main purpose of the interview was to gain a deeper understanding of how the participants currently use the LMS and to help identify the appropriate pilot system for them.

For example, two engineering instructors volunteered to be part of the evaluation. During the initial interview, one of them spoke about their previous experience in Brightspace and Blackboard. The second instructor had no experience using Brightspace or Canvas. Therefore, they were asked to pilot Brightspace while the first instructor was asked to pilot Canvas.

Initially, we met our goal of 30 faculty members but some were forced to drop out due to other considerations. Given that we were not running the full pilot of Ultra, we did not seek replacements. The following is a list of what disciplines and colleges were represented in each pilot system:

Blackboard Ultra

Department	**College**
Neurobiology and Behavior	Agriculture and Life Sciences
Asian Studies	Arts and Sciences
Chemistry	Arts and Sciences
Philosophy	Arts and Sciences
Human Development	Human Ecology

Industrial and Labor Relations	Industrial and Labor Relations

Brightspace

Department	**College**
Center for Teaching Innovation	Agriculture and Life Sciences
Chemistry	Arts and Sciences
Classics	Arts and Sciences
Near Eastern Studies	Arts and Sciences
Philosophy	Arts and Sciences
Romance Studies	Arts and Sciences
Mechanical and Aerospace Engineering	Engineering
Hotel Administration	Hotel Administration
Labor Economics	Industrial and Labor Relations
Clinical Sciences	Vet College

Canvas

Department	**College**
Communication	Agriculture and Life Sciences
Biology	Agriculture and Life Sciences
Philosophy	Arts and Sciences
Romance Studies	Arts and Sciences
Computer Science	Computing and Information Science
Engineering Communications	Engineering
Hotel Administration	Hotel Administration
Human Development	Human Ecology
Labor Relations, Law, and History	Industrial and Labor Relations
Graduate Management Research	Johnson Graduate School of Management

Figure 8-1. A list of disciplines and colleges included in the pilot semester

8.3. Pilot Support

Blackboard Learn 9.1 is currently supported by a team of instructional technologists and instructional designers. Faculty members can e-mail, call, or drop-in to CTI's technology center (formerly known as the Academic Technology Center) for assistance. CTI also offers in-person consultations and training sessions for faculty and teaching assistants that would like someone to help design their course or learn more about using Blackboard.

To replicate this support model, each of the pilot systems was assigned a primary and secondary instructional designer to act as subject matter experts for the length of the pilot. The primary support person was responsible for working with faculty members to ensure that their course was up and running in the pilot system in time for the fall semester. Faculty were not told how this should be accomplished. In the standard support model, some faculty copy their courses from a

previous semester and some recreate their course. In the pilot, faculty were also given the same option, with the instructional designers there to assist them should they need it.

In addition to the dedicated subject matter experts, each pilot system had its own support e-mail address that faculty could use at any time. Dedicated support websites were created, and contained information on how to get started, where to go for vendor created support, and how to get in touch with dedicated Cornell support. Faculty were also asked to have an initial meeting with their instructional designer. The purpose of these meetings was to introduce the instructor to their support for the pilot, be acquainted with the pilot system, and to answer any questions. Instructors were also provided with a packet of information (hardcopy and digital) detailing their participation in the pilot and how to get support.

8.4. Faculty Survey and Interview Pilot Analysis

One of the primary objectives of the pilot semester was to evaluate how faculty interact with alternative systems and gather feedback about their experiences. To help achieve this goal, we created a series of touchpoints throughout the pilot semester. Faculty were asked to take three surveys: one at the beginning of their course, one towards the middle, and one at the end. They were also asked to be part of a 30-minute interview towards the end of the semester.

At the start of the pilot semester, it became apparent that the faculty members participating in the Ultra pilot felt that the Ultra experience was almost identical to our current Blackboard. Because of this, we surveyed Ultra participants once (instead of three times) and used a slightly different survey than Brightspace or Canvas participants. Note: the simplified Blackboard Ultra version was unavailable for piloting (as discussed previously). An analysis of that survey is included below.

8.5. Survey and Interview Methodology

Learning about instructor experiences during the pilot was vital to our evaluation process. Participants were asked to take three short surveys. Each of the surveys began two to three unique questioned that focused on different aspects of using the LMS, detailed below:

- **First Survey**: The first survey asked faculty to reflect on their experiences migrating to the pilot system. It was sent during the second week of the semester.
- **Second Survey**: The second survey focused on teaching in the course and asked faculty to reflect on whether they had tried anything new in the pilot. This survey was sent in the middle of the semester.
- **Third Survey**: The final survey asked faculty to reflect on the semester overall and was sent at the end of the term.

In addition to these questions, each of the surveys asked faculty a set of five questions. The same questions were asked in the first, second, and third survey. These questions were repeated in each survey so that we could determine how, or if, the experiences changed throughout the semester. These trended questions ask faculty to compare their experience to Blackboard, rate their overall experience, and asked faculty to rate their experience with different aspects of the LMS (such as navigating the course or using the grade book feature). The surveys also asked faculty what they liked most and least about the system.

An *additional* survey was given to participants only in the Ultra pilot. This survey asked faculty to reflect on the differences between our current Blackboard and the changes made in Blackboard Ultra. This survey was sent in the middle of the semester.

The surveys took approximately 10 minutes to complete. Survey questions were optional and included both close-ended and open-ended questions. Participants had the ability to terminate their participation at any time. All survey responses are confidential. Copies of the survey questions for Blackboard Ultra, Brightspace, and Canvas can be found in Appendices E, F, and G. Copies of the final survey responses made by faculty piloting the three systems can be found in appendices H, I, and J.

Towards the end of the pilot semester, we asked faculty to participate in one final 30-minute structured interview. The goal of the interviews was to gather qualitative feedback about the faculty's experiences during the course of the semester. Each interview was conducted face-to-face or via video conference with two members of the project team and lasted for 30 minutes. Hand-written notes were taken at each interview. Due to scheduling conflicts, two of the faculty members were unavailable for the interview. Findings from the interviews are included in the analysis below.

8.6. Survey Analysis

This analysis is divided into five sub-sections. The first three focus on the unique questions asked during the first, second, and third surveys for Brightspace and Canvas. The fourth section examines the block of five questions that were asked in each of the Brightspace and Canvas surveys. The final section analyzes the questions specific to Blackboard Ultra.

First Survey – Migrating to the pilot system

Brightspace Summary: Almost all pilot members opted to create their course from scratch. Faculty found adding content to Brightspace to be easy, but struggled with understanding the workflow to create assignments and use the gradebook. Overall, faculty indicated they would be comfortable creating another course from Brightspace on their own.

Canvas Summary: Faculty occasionally struggled with Canvas's approach to using modules and bulk uploading files. Several commented that the Canvas help documentation was very helpful. Overall, faculty indicated they would be comfortable creating another course from Canvas on their own.

The first survey asked faculty to reflect on their experiences migrating to the pilot system. It was sent during the second week of the semester.

Instructors were asked to identify whether they had ever used the pilot system before, and if so, for how long. With the exception of one Canvas participant, none of the faculty had ever used their pilot system before.

We then asked whether they had created their course from scratch, if they had imported it from an existing Blackboard course, or tried both methods (Figure 7-2).

	Brightspace	Canvas
I created it from scratch	8	7
I imported a course package	1	0
I tried both methods	0	3

Figure 8-2. Course creation methods used in the pilot by Canvas and Brightspace faculty

Depending on whether they migrated their course or created a new one, participants were asked to rate their experience (Figure 7-3).

How would you rate your experience creating a course from scratch?

	Brightspace	Canvas
Very easy	0	2
Somewhat easy	3	4
Neither easy nor difficult	2	2
Somewhat difficult	3	2
Very difficult	0	0

How would you rate your experience migrating your course?

	Brightspace	Canvas
Very easy	0	0
Somewhat easy	0	1
Neither easy nor difficult	1	0
Somewhat difficult	0	1
Very difficult	0	1

Figure 8-3. Faculty experience ratings for creating their courses in Brightspace and Canvas

Prior to the pilot semester, we performed our own tests on migrating courses into Canvas and found that using the Canvas import tool to bring over an existing course sometimes resulted in more clean-up work than creating a course from scratch. The instructional designer assigned to support the Canvas pilot warned the faculty of this, which may be the reason why none imported an existing course. Comments from the interviews and survey echo the results above, and most of the faculty found creating their own course in Canvas to be straightforward. In addition, one person found Canvas provided documentation to be unhelpful, while others praised the level of ease in which they found help online. For example, one pilot faculty wrote, "I found it really intuitive to use Canvas plus there are tons of resources online to help trouble shoot."

Another Canvas pilot faculty member said,

> *"My experience was much much more positive than past attempts to wrap my brain around Blackboard. Still, I did google a bunch of questions, email Liz [instructional designer] a lot and used trial and error. I suspect the second time around would be much easier."*

In contrast to Canvas, our evaluation team found that migrating a course into Brightspace (using their import tool) was a much cleaner transfer. However, most of the faculty members still took creating their course from scratch as an opportunity to learn how Brightspace works. One faculty member commented, "It takes a little time to familiarize myself with the layout and interface, but

making content areas is pretty straightforward." Others echoed this and said that uploading content was easy, however mastering the workflow to add assignments was sometimes difficult.

One Brightspace pilot faculty member summarized by saying,

> *"I found the way the elements of the course site and the workflows required to set things up counterintuitive and difficult to figure out. The process of creating assignments and creating an automatic grade book seems especially cumbersome. I created my course on the fly and bits of it ad hoc. So it may be that building it methodically from the ground up using the course builder tool would give a different experience. But I'm unlikely to build a course that way."*

Originally, we had one more pilot member for Brightspace. The instructor had used Blackboard for years, and their course had over two hundred content items. Unfortunately, we were unable to start transferring content over to the new system until a few days before the fall semester. The instructor, after seeing the amount of work involved in transferring material and learning a new LMS, decided they could not be part of the pilot. It is our judgment that this would have happened in Canvas as well, due to the short time in which the faculty member had to learn a new system and transfer content. The rest of the faculty involved in the pilots had all summer to prepare and migrate their course to a new system. One faculty member made a point of using the pilot as an opportunity to reevaluate the design of their content in the LMS and to trim away some old information that was no longer necessary. Others made an effort to make their pilot course as similar as possible to their current Blackboard course.

Finally, as Figure 7-4 shows, we asked faculty whether they would be confident creating a course in the system completely on their own:

If you had the opportunity to teach another course using the pilot system, how confident would you be in creating the course on your own?		
	Brightspace	**Canvas**
Very confident	3	5
Somewhat confident	5	4
Neutral	1	1
Somewhat unconfident	0	0
Very unconfident	0	0

Figure 8-4. Faculty reported confidence level in creating another course by themselves in Canvas and Brightspace

Responses indicate that both Brightspace and Canvas users would be comfortable making another course on their own.

Second Survey – Teaching in the pilot system

Brightspace Summary: In general, although some felt that using Brightspace tools was easy, the majority of pilot faculty found the Brightspace workflow to be unintuitive. When asked if they heard any feedback from students, faculty in both pilot systems said that some students would forget the URL to the pilot system, would not remember to access the course all together, or would forget how and where to find the information in the course.

Canvas Summary: Overall, it seems that faculty members using Canvas did more exploration into the different features and functions available. This may be because, although there is a learning curve, they felt Canvas was generally intuitive to use. When asked if they had heard student feedback, faculty indicated that students were not thrilled about using multiple systems (both Canvas and Blackboard), but overall seemed fine with using Canvas.

The second survey focused on teaching in the course and asked faculty to reflect on whether they had tried anything new in the pilot. This survey was sent in the middle of the semester.

We asked faculty, “Have you tried something new in your course? Something that you have not done before?” and received mixed responses.

Two of our Brightspace faculty responded that they had not done anything differently, with one specifically calling out that their intent was to make the course as similar to Blackboard as possible. Other faculty members indicated that they were doing different things, but that was normal and had nothing to do with the Brightspace pilot. Several faculty members used Brightspace’s discussion boards (they normally do not use them in Blackboard). One felt that Brightspace had too many steps when setting up the discussions. Two others found it relatively easy to set up discussion forums in Brightspace, however, all three noted a low interaction rate from students. More investigation would be needed to understand the cause behind the low interaction rate.

In contrast to Brightspace, the majority of the Canvas pilot members tried something new in their course. For instance, one faculty member added quizzes and changed the organization of their course to include more news articles. Another explained, “In Blackboard, I never put students into teams, which I've done now in Canvas. I also never had students submit assignments via Blackboard because it was clunky. In Canvas, I've done this and it works very well.” Notably, many of the new tools that faculty tried in Canvas have a comparative version available in Brightspace. An example of this is the attendance tool, which several Canvas faculty used (and enjoyed using) during the pilot. Faculty in the Brightspace pilot may not have realized there was an attendance tool, might not have understood how to use it, or it might not have suited their needs.

Faculty members were also asked whether they heard any feedback from students using the pilot systems (students were also given their own survey and that analysis is included later on). Our goal here was to understand the faculty impression of student usage. Regardless of what system they were using, faculty said their students expressed frustration in using two different learning management systems. In our interviews with faculty, they explained that students would forget

the URL to the pilot system, would not remember to access the course altogether, or would forget how and where to find the information in the course.

One faculty member using Brightspace said, "… My general sense is that none of us are using the page as much this semester as I have done with Blackboard pages in past semesters." Others in the Brightspace pilot said their students commented on the ease in which they could download content but also that pdfs did not always display correctly. Faculty members using Canvas said their students sometimes had problems finding things, but overall, seem to be fine with using Canvas. Several commented that their students are "agile" and adjust quickly. One went on to say, "…The students don't seem to care what LMS we use as long as the instructor is familiar with the system and they get all the materials to succeed in the course. I would take student feedback carefully, as they may reflect the instructor's lack of experience rather than the quality of the LMS."

Third Survey – Overall impression of the pilot system

Brightspace Summary: Overall, faculty using Brightspace felt that it was average, or about the same as Blackboard and could see no functionality that made it stand out. The majority would prefer to continue using Blackboard.

Canvas Summary: Overall, faculty using Canvas found it "less clunky" than Blackboard and enjoyed the updated modern interface, and commented on the new features it offers. The majority of the faculty piloting Canvas would prefer to use it to Blackboard.

The final survey asked faculty to reflect on the semester overall and was sent at the end of the term.

At the end of the semester the final survey asked, "In the future, would you prefer to use the [pilot system] instead of Blackboard?" In Brightspace, out of the nine faculty members responding, one had no opinion, three were in favor of using it again, and the remaining five would prefer to use Blackboard instead. Of the three who would like to use it again, one faculty member commented, "I like the simplicity and the 'fluidity' of Brightspace, even though I believe that beyond its austerity, Blackboard is somehow more powerful and allows the instructor to do potentially more things." The other two faculty echoed their satisfaction with how content is visually organized in Brightspace. Those that would prefer to use Blackboard said, "It's not better than Blackboard, though it seems just as good" and "I didn't see a significant improvement over the current Blackboard version." Others felt that Brightspace was not intuitive enough. For example, in one of our in-person interviews, a faculty described Brightspace by saying, "everything seemed really complicated" and demonstrated what they meant by referencing their Brightspace course. Our interpretation of this is that the Brightspace layout is so conceptually different from Blackboard, faculty have to spend a greater amount of effort learning how to use it and may not want to devote that time.

Notably, one faculty member participated in both the Brightspace and the Canvas pilot. He has not used Blackboard, being skeptical of the value of an LMS and preferring to make his own course website. When asked about whether he would prefer to use Brightspace, his response was

“no opinion.” That same faculty member was also in the Canvas pilot and was one of six to say that they would enjoy using Canvas in the future.

Overall, six out of ten participants enjoyed using Canvas to some degree. Faculty who used it for the most common features (uploading content, syllabus, and some assignments) enjoyed using Canvas the most. Others, who may use advanced features to accomplish very specific tasks or who teach larger classes, preferred their current Blackboard workflow. For instance, those in favor of using Canvas again cited that it was “less clunky” and easier to use overall. Specifically, it offers features that Blackboard does not, including a calendar that auto-populates with assignments and in-line grading functionality. Faculty also felt the modern interface was “easy to configure and manage.” The remaining four faculty members said they would not want to use Canvas again. One faculty member explained that while Canvas is nicer looking, it “does not have the bells and whistles (drag and drop function??) that would make it better than the current version of Blackboard.” Another, who teaches a large course of over 200 students, found that how they currently use Blackboard did not translate well into Canvas.

In an effort to identify what role support played in their pilot experience, we also asked faculty, “How would your experience [with the pilot system] have been different if you did not have a dedicated support contact?” Faculty in the Brightspace pilot commented that it would have been frustrating and a steeper learning curve. In interviews, several commented on the difficulty they had using the online support offerings provided by Brightspace. The general sense is that help documentation was difficult to find, and when found, was sparse.

In the Canvas pilot, responses were split between “impossible” and that it would have been do-able without support. It is critical to note that those who said it would have been impossible each had different and very specific advanced use cases, and more than likely would have to work with support regardless of the LMS being used. Others responded by saying variations of, “I would have spent a little more time navigating the extensive online support that Canvas offers. Liz [the instructional designer] saved me that time for a few tasks and questions” and “It was better with Elizabeth's [the instructional designer] initial help, but do-able.”

Brightspace Trended Survey Questions

Brightspace Summary: When asked to compare their experiences using Brightspace to Blackboard, all but two of the faculty members preferred Blackboard. Those that started the semester feeling dissatisfied with Brightspace continued to be throughout the term. Uploading content and organizing it was easy, however faculty found that doing anything more advanced than just uploading content was difficult and remained difficult. Several commented on feeling as if they had to relearn Brightspace every time they logged into the system. Overall, while faculty enjoyed the modern and clean look of Brightspace, they found it confusing and unintuitive to navigate. Faculty satisfaction with Brightspace did not increase over the course of the semester.

To identify trends occurring throughout the pilot semester, we asked the same five questions in the first, second, and third surveys. Below is an analysis of those questions.

In both the Brightspace and Canvas pilot surveys, faculty were asked to compare their experience in the pilot system to their experiences in Blackboard. They were also asked to rate

their overall experience using the pilot system. Expanding on these questions, we also asked faculty to rate their experiences with specific functions of the pilot system (for example, navigating the course). These same three questions were asked at the start of the semester, the middle, and at the end. Due to the effort involved in the transition and migrating to a new LMS, we anticipated seeing lower ratings at the start of the semester improvements at the middle and end of the term.

However, that was not the case in Brightspace. Out of ten faculty members who completed surveys, only two ended with a positive trend when compared to Blackboard. Three consistently thought that Brightspace was average, or about the same as the current system. The remaining faculty felt that Brightspace was somewhat worse than Blackboard. Several of those faculty members began the semester by rating Brightspace was better than Blackboard, but with extended use changed their opinions.

A similar trend occurred when we asked faculty to rate their experience overall using Brightspace. Four faculty began the semester feeling dissatisfied with Brightspace and consistently stayed dissatisfied (although one improved from extremely dissatisfied to somewhat dissatisfied). Additionally, of the five faculty members who began the semester feeling somewhat satisfied with Brightspace, two ended the semester feeling neutral and three remained somewhat satisfied.

To help us understand why faculty were, or were not, satisfied with Brightspace we asked what they liked most and least about the system. To identify potential trends, this question was asked throughout each of the three surveys. Consistently, faculty members using Brightspace most appreciated the modern design of its interface and the ease of adding content. One faculty member described the user interface as, “bright and inviting, doesn’t look like a no-frills wiki.” Faculty members also appreciated that content can be dragged and dropped both when uploading material and when rearranging the content for viewing. Brightspace also offers a feature that helps faculty easily figure out who has been accessing the course and how frequently. During an interview, one faculty member described how they were able to speak with a student who was not doing very well in the course. By using Brightspace, they were able to identify that the student was not logging in as frequently and as a result, may not have been spending a lot of time with the material. However, they went on to say add that because Brightspace allows students to easily download content, the student may have downloaded the whole course and then did not feel the need to log in again.

Depending on the timing of the survey, what faculty liked least about Brightspace was slightly different. In the beginning, when setting up their course, faculty found the Brightspace help documentation to be lacking. Additionally, some aspects of Brightspace were found to be counter-intuitive. Brightspace uses an open navigational layout (instead of the linear style found in Blackboard), which requires users to be comfortable with the various aspects of the system in order to accomplish their intended action. For example, the top navigational bar in Brightspace has a button for assignments. After clicking on this button, faculty are presented with “Assignment Submission Folders” and the ability to create a new folder, as well as view the ones already created and their assignments. The idea of an “assignment submission folder” is different from what faculty are used to in Blackboard. During interviews, one faculty member summarized this by saying, “you would think that in order to create an assignment you click on assignments. Instead you get a submission folder and it was a bit of a struggle to figure it out.”

As the semester continued, when faculty began using the grade book more heavily, they experienced frustrations. Much of this stemmed from the navigational issues mentioned previously.

We also asked faculty to rate their overall experience with different components of Brightspace. Scores were based on a 5-point Likert scale with one representing extremely bad and five for extremely good. The data over the course of the semester shows that faculty became slightly more comfortable with navigating the course, modifying course content, grading, and using the grade book. However, they became increasingly dissatisfied with communicating with students through Brightspace, and finding help online (Figure 7-5).

Brightspace	Beginning	Middle	End
Navigating your course	2.67	3.11	3.13
Adding content to your course	3.50	2.56	3.50
Modifying content in your course	2.90	3.00	3.38
Communicating with students	3.00	2.75	2.38
Tracking student progress	2.20	3.80	3.38
Grading assignments	2.25	3.20	3.33
Using the gradebook	3.14	3.00	3.33
Finding help online	3.33	3.00	2.71
Getting support from my contact person	3.80	4.00	4.25

Figure 8-5. Faculty satisfaction levels with Brightspace functions trended over three surveys

Canvas Trended Survey Questions

Canvas Summary: When asked to compare their experiences using Canvas to Blackboard, the majority of pilot faculty prefer Canvas. Faculty were impressed with how intuitive and easy Canvas was to use, commenting that it's "somehow more intuitive for the basic bits." Not all faculty were happy with the module layout used by Canvas, which may affect courses with a lot of content. Much of what faculty liked the least were smaller features or functions that vary based on use case and did not have a common theme. Overall, faculty were more enthusiastic about using Canvas and trying out the new features and functions it offers. Faculty satisfaction with Canvas steadily increased throughout the semester.

Out of the ten Canvas pilot participants, only one ended the semester feeling that their Canvas experience was "terrible, much worse" than Blackboard. Three felt that it was average, or about the same. The remaining five participants felt that Canvas was better than the current Blackboard system (one had never used Blackboard before). Similarly, when asked to rate their overall experience in Canvas, only one participant consistently rated that they were dissatisfied with the LMS. Another began and ended neither satisfied nor dissatisfied, while the remaining faculty members were consistently split between being extremely satisfied or somewhat satisfied.

To help us understand why faculty were, or were not, satisfied with Canvas we asked what they liked most and least about the system. Consistently throughout the semester, faculty commented on the clean and modern interface that Canvas offers. During our interviews, a faculty member

described Canvas by saying, “It looks like something from the 21st Century, which is very uplifting.” In the second and third surveys, faculty also mention their appreciation for how intuitive it is to use the different features of Canvas. Participants also commented on the usefulness of the online community and the support documentation provided by Canvas. In interviews, faculty discussed the usefulness of being able to go to the Canvas community and get help from other faculty members or use the Canvas provided how-to guides. Several faculty mention certain features of Canvas that stood out, including the inline grading functionality, the calendar, and the overall structure. Similar to Brightspace, faculty appreciated that they could track how frequently students are accessing the course.

However, not all participants liked the structure of Canvas. Instead of using folders, Canvas uses modules. Where Blackboard’s folders can be separated into different content areas (using the left navigational bar), in Canvas modules are all stored on the same page and are separated by headers (with an option for indenting). By default, in Canvas all of the modules are expanded. For large classes with a lot of content, this can result in students and faculty having to scroll down to find the piece of content they need. During our in-person interviews, one faculty member demonstrated by showing the amount of scrolling a student would have to do in order to navigate the amount of content in their large course.

Several faculty members commented on their frustration with the Turnitin integration. Turnitin, usually integrated via building block in Blackboard, is instead integrated via LTI[2]. This style of integration results in the loss of some functionality as it is not as tightly connected to the system, as it would be if integrated via building block. It is important to note that Turnitin integrates via LTI for Brightspace and Blackboard Ultra as well. More information on this can be found in the Technical analysis section of this report.

Overall, much of what faculty liked the least were smaller features or functions that range based on use case. For example, several faculty commented on the grade book but all for different reasons. One faculty member said that for their large course, and the current workflow for how they provide feedback, Canvas did not offer the functionality they were hoping it would. Another enjoys the Speedgrader feature but wishes it could connect to Turnitin. A third faculty member appreciated the way Canvas “pings”, or reminds, them of items they have left to grade.

To give an overall picture of how faculty felt about different aspects of Canvas, we asked them to rate various components three times throughout the semester. Navigating their course, getting support, and finding help online were rated similarly throughout the semester. Satisfaction with adding content to the course, modifying the content, communicating with students, and tracking student progress seems to improve with usage. In contrast, satisfaction with grading assignments and using the grade book varied throughout the semester. Overall, faculty satisfaction with Canvas grew throughout the semester.

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[2] See technical analysis section for explanation of LTI.

Canvas	Beginning	Middle	End
Navigating your course	2.90	3.10	3.00
Adding content to your course	2.60	4.00	4.30
Modifying content in your course	3.70	3.60	4.10
Communicating with students	2.86	3.60	3.50
Tracking student progress	3.00	3.63	3.90
Grading assignments in Canvas	3.80	2.63	3.88
Using the Canvas gradebook	4.00	3.33	3.56
Finding help online	3.70	4.00	3.80
Getting support from my contact person	4.70	5.00	5.00

Figure 8-6. Faculty satisfaction levels with Canvas functions trended over three surveys

Blackboard Ultra Survey Questions

Blackboard Ultra Summary: Faculty piloting the Blackboard Ultra experience appreciated the updated user interface but were disappointed that it did not fix any of their current issues with Blackboard. In two cases, due to third party issues, users preferred the traditional Blackboard experience. This is expected, as the Blackboard Ultra version we piloted had no functional change other than using LTI integrations, instead of building blocks, which resulted in some functionality loss for Turnitin (more information on this can be found in the requirements comparison section of the report.).

Given to participants only in the Ultra pilot, this survey asked faculty to reflect on the differences between our current Blackboard and the changes made in Blackboard Ultra. As noted above, we originally intended to pilot the new streamlined view of Ultra. However, at the time of the fall pilot semester, that particular version of Blackboard Ultra was not ready for live testing. Instead, we piloted the "original" view of Blackboard Ultra, which is essentially the current Blackboard with an updated appearance to the interface. This survey was sent in the middle of the semester.

The survey for the faculty members in the Ultra pilot began by asking whether they prefer the current interface, the new one, whether they saw a difference, or if they had an opinion. For reference, there were two screenshots included along with the question (one of the current system, and one of the Ultra experience). Of the five survey participants (the summer Ultra pilot did not have a survey), four responded by saying they liked the current Blackboard interface, one had no opinion, and the fifth did not see a difference.

Comments from the faculty went into detail about some of the user experience inconsistencies prompting them to prefer the current Blackboard. For example, one faculty member was frustrated because refreshing the webpage takes users back to the home page instead of the course page where they were originally. Another explained, "it's a little prettier than Blackboard and that's it. It does not fix any of the annoying issues with Blackboard." This is similar to another faculty member who summarized by saying, "I am not a huge fan of the traditional display, but I don't see any benefit to the new display. The visual display is slightly different, but it's not a substantive difference."

As with the Brightspace and Canvas surveys, we asked Ultra pilot faculty whether they had tried something new in their course this semester (because of using Ultra). One faculty member tried online discussions and said that it worked "flawlessly from the start." Otherwise, all faculty members did the same thing in Ultra as they would have done in Blackboard.

Faculty were also asked if they had gotten feedback from students, and if so, to describe some of that feedback. Two faculty members mentioned issues with uploading assignments. In one scenario, Blackboard would tell students that their assignment was not uploaded but the TA and instructor could see it. The remaining faculty had not heard a lot of feedback from students.

We also inquired about the role of the support person during the pilot experience. Responders unanimously agreed that, without the instructional designer's help, using Ultra would have been very difficult. This is most likely because, although there is no functional difference between the two systems, the way 3rd party integrations connect was slightly different. This is especially true for Turnitin, which usually integrates via building block, but integrated via LTI.

When asked to rate their overall experience with the Blackboard Ultra pilot system, three of the five responders indicated that they were neither satisfied nor dissatisfied and compared their experience in Blackboard Ultra to be about the same as it would have been in the current Blackboard system. Two faculty members responded that they were dissatisfied with Blackboard Ultra, largely due to 3rd party technical issues (with Panopto and TII) they experienced throughout the semester. Both felt their Blackboard Ultra experience was worse than the current Blackboard system.

Participants were asked to rate their overall experience with different aspects of the Blackboard Ultra system. Scores were based on a 5-point Likert scale with one representing extremely bad and five for extremely good. Overall, the majority of responses fall into the neutral range with the exceptions of support (which fell between somewhat good and extremely good) and the grade book functionality (scoring close to somewhat bad).

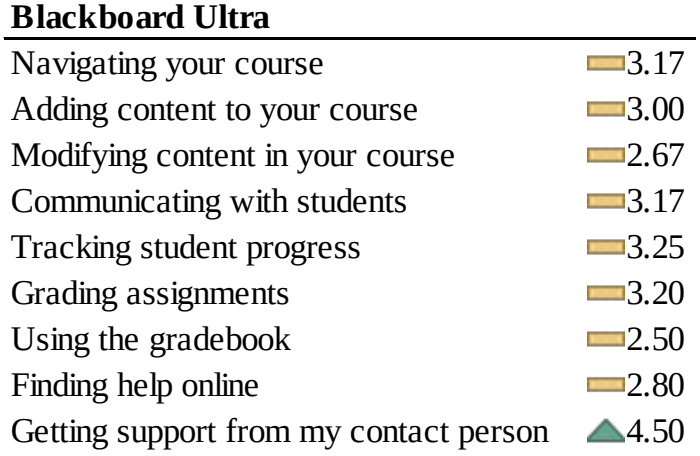

Figure 8-7. Faculty satisfaction levels with Blackboard Ultra functions

Pilot faculty members were also asked to discuss what they liked most and least about the Blackboard Ultra experience. When talking about what they liked the most, responses generally ranged from not seeing a huge difference to appreciating the new interface. One user summarized this as, "Nothing in particular stands out. It's the same blackboard with a 'sparkly'

layer that does not offer much functionality. Integration with Panopto is very much appreciated, but the old blackboard did that too." Faculty least liked the integrations with third-party providers, particularly with the number of clicks and length of time it takes to integrate with Panopto videos.

Overall, faculty using the Blackboard Ultra experience felt like the update to the new user interface, while pretty, was not enough to change the way they felt about using Blackboard. In some cases, due to third party technical issues, users preferred the traditional Blackboard experience.

8.7. Student Survey Results

Another of the primary goals during the pilot semester was to evaluate how students interact with alternative learning management systems. To achieve this goal, we developed a survey intended to gather pilot experiences from the student perspective.

Survey Methodology

A URL to the anonymous student survey was sent to pilot faculty members in the middle of the semester. Faculty were asked to provide the survey to students, or we offered to post the link as an announcement in their course. Due to a miscommunication, some faculty thought the LMS evaluation team would be sending the survey directly to their students. As a result, students in those classes might not have received the link to take the survey, which may account for a lower student response rate. Student responses are reported in aggregate for each LMS pilot.

The survey took approximately ten minutes to complete. Survey questions were optional and included both close-ended and open-ended questions. Participants had the ability to terminate their participation at any time. All survey responses are confidential.

Copies of the survey questions can be found in Appendices K, L, and M.

Survey Analysis

This analysis is divided into three sub-sections, each dedicated to a specific pilot system.

Repeatedly, throughout all of the survey questions, students commented on their dislike of using two different systems. In some instances was the only reason they gave for why they chose a lower rating. For instance, one student commented that using two systems was, "Incredibly annoying and disruptive to have to switch to this system after using Blackboard for EVERY other class…" Students echoed this sentiment across all three pilot systems. This was an unavoidable consequence of doing the pilot and highlights the advantage of having one centralized system.

Blackboard Ultra Student Survey

Summary: With an overall response rate of 14.37%, the majority (40.82%) of students preferred the traditional Blackboard interface. As with the faculty survey, most of the student participants appreciate the modern appearance but have other concerns about functionality. Coinciding with that, almost half the students prefer our current Blackboard system to Ultra. However, just over 40% (the majority) of students report being at least somewhat satisfied with the pilot system. Overall, students appreciate the newer clean interface.

Just like the faculty piloting Blackboard Ultra, students in the Blackboard Ultra pilot were sent a slightly different survey than Brightspace or Canvas participants.

The overall response rate in the Blackboard Ultra survey was 14.37%. Of those that responded, a plurality of participants (40.82%) prefer the traditional Blackboard interface, while 30.61% like the new interface. Another 14.29% found no difference between the two, and the remaining 14.29% had no opinion (Figure 7-9). One student who responded with no opinion explained, "The new Blackboard system worked well but so did the old system so I don't have a preference." Several students who prefer the new interface commented that it was cleaner and easier to navigate. Blackboard Ultra includes a different landing page[3], where students are greeted with an "activity stream" of information about all of their courses. Some students were in favor of this, and others were not. A student who prefers the traditional Blackboard interface commented,

> *"The updated Blackboard Ultra system is nice when it comes to viewing grades and feedback on assignments. However, it is inferior to the traditional system in organization. The initial announcements page would be confusing if I had multiple courses on blackboard ultra. I prefer the traditional blackboard opening up to a page with my list of courses first."*

As with the Canvas and Brightspace surveys, we asked students in the Blackboard Ultra survey how they would rate their overall experience using the pilot system. The plurality of students (40.82%) were either somewhat satisfied or extremely satisfied (Figure 7-10). Almost thirty-five percent (34.69%) were dissatisfied, and the remaining 24.29% of students were neither satisfied nor dissatisfied.

The survey also asked students whether they prefer the current Blackboard interface, the new one, whether they saw a difference, or if they had an opinion. For reference, there were two screenshots included along with the question (one of the current system, and one of the Ultra experience). Almost half (48.98%) felt that the Blackboard interface was inferior to the current interface. Just over thirty percent (30.61%) felt that it was an improvement, and the remaining 20.41% was neutral (Figure 7-11).

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[3] A landing page, or a home page, is the main screen that users are greeted with upon logging into the system.

When asked what they like most about the Blackboard Ultra pilot system, most students responded that they enjoyed the cleaner interface. Comments ranged from “it looks nice” to “The color scheme is appealing and I like the ‘See My Grades’ interface.” Yet others, when asked what they liked least about the system, said the interface was their least favorite part and that it was unattractive and added nothing, and that it added more steps to get to their course. Some students responded by saying that it was difficult to find grades (perhaps because they moved to a new interface). Several students commented that turning in assignments felt difficult. We believe that this is in response to the Turnitin integration, which as previously mentioned, is via LTI instead of the traditional building block integration and therefore has some loss in functionality.

Similar to the faculty survey, students were asked to rate their overall experience with different components of Blackboard Ultra. Students used a Likert-scale that ranged from one to extremely bad and five for extremely good. They could also choose “I have not done this” for each item. Overall, the majority of students scored Blackboard in the neutral range (between 2.5 and 3.5). See the figure below for more details.

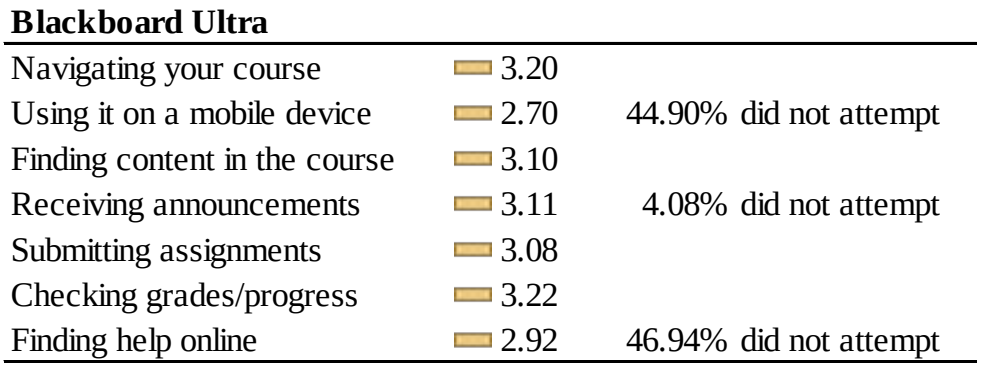

Figure 8-8. Student satisfaction levels with Blackboard Ultra functions

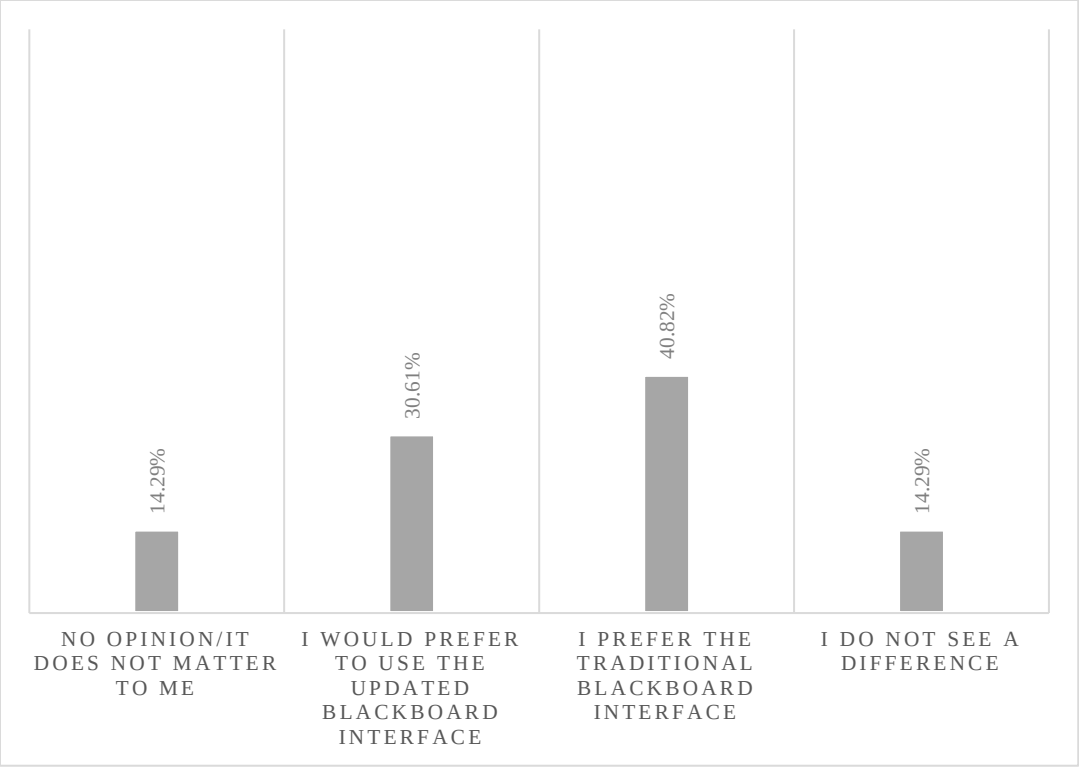

Figure 8-9. In the future, would you prefer to use the updated Blackboard pilot system instead of our traditional Blackboard system? (All student responses)

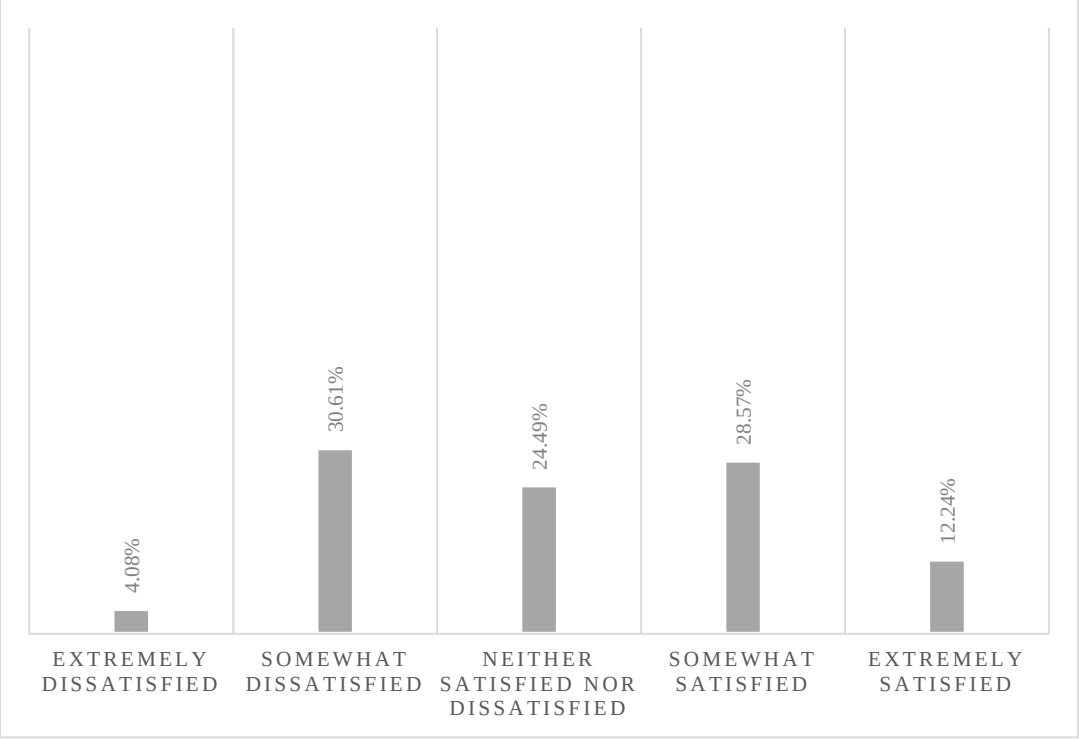

Figure 8-10. How would you rate your overall experience using the Blackboard Ultra pilot system? (All student responses)

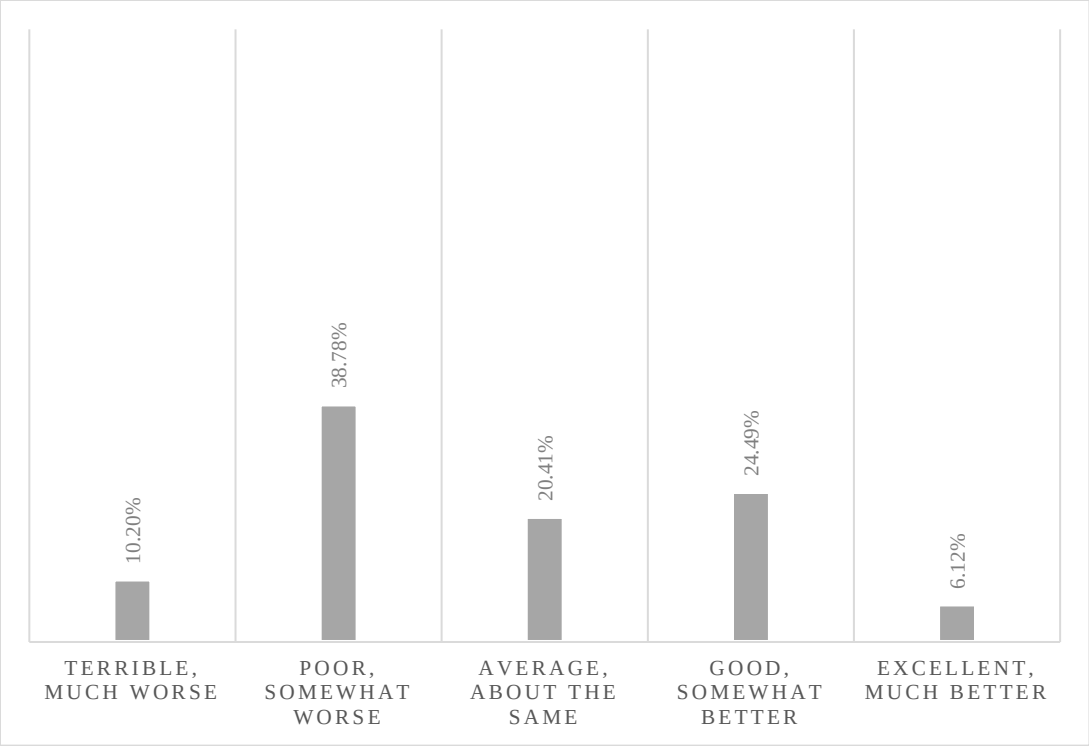

Figure 8-11. How does your experience compare with our traditional Blackboard system? (All student responses)

Brightspace Student Survey

Summary: Survey response rate was 17.04%. A plurality of students rated their overall Brightspace experience as neutral (41.18%). Paradoxically, 45.28% of students said their experience was poor, or much worse than Blackboard. This may be due to several contributing factors, including students being unfamiliar with the layout of the system, confused by how the faculty organized the course, and disliking having to use multiple systems. Students who were satisfied with Brightspace (33.33%) enjoyed it for the clean and modern looking interface, the calendar function, and the overall feel of the system.

The Brightspace student pilot survey had a response rate of 17.04%. Students were first asked to rate their overall experience using the Brightspace system. They were provided with a Likert-scale ranging from very satisfied to very dissatisfied. A plurality of participants responded with a neutral score (41.18%), followed by 33.33% who indicated they were either satisfied or very satisfied. The remaining 25.49% of students said they were either dissatisfied or very dissatisfied with Brightspace (Figure 7-13).

Students were also asked to compare their experience in the pilot system to their experiences in Blackboard. Overall, 45.28% of students said their experience in Brightspace was poor or much worse than their experiences in Blackboard. Another 28.30% responded that it was about the same, and the remaining 26.42% of students said it was a noticeable improvement or much better than Blackboard (Figure 7-14).

To help identify why students were or were not satisfied with Brightspace, we asked them to reflect on what they liked most and least about the system. Comments on what they enjoyed the most range from “clean interface” to “loads fast” and generally enjoying how Brightspace is laid out. Several students also comment that the mobile version of Brightspace is much better and easier to navigate than the Blackboard mobile version (however, it should be noted that Blackboard recently overhauled their mobile app and we do not know what version the students were comparing). Students also commented on their appreciation for the Brightspace calendar feature, which shows upcoming due dates for assignments.

When asked what they liked the least about Brightspace, many of the comments reflect the navigation and layout of the system. For instance, several comments from students explain that it took too long to find what they were looking for, or that it was confusing. It is unclear if this is based on the system itself or by the organization of the course. Several students comment on their frustration with getting notifications. As one said, “I literally never get notifications.” This is perhaps because of the default notification settings within Brightspace. Students have the ability to change their default notifications, including receiving notifications via SMS (text message) but are not prompted to make those changes and need to be proactive in updating settings. Cornell could invest in a customization (API) that automatically updates settings for students.

When asked to provide additional qualitative feedback on their experiences, the responses were varied. While some students responded that the interface was more intuitive and modern, others found it confusing to navigate.

Comments from students also reflected how the faculty had set up their course. For example,

> *“Brightspace is confusing to navigate. There are a lot of misleading headers that do not lead where they seem they would; for example, a topic under ‘Content for Week 11’ will have a link to the Discussion posts for that week, but, when that link is clicked on, it will go to the last Discussion post opened. This means that clicking on an item for one week will lead to a page from a previous week.”*

Additionally, we asked participants to score their overall experience with different components of Brightspace. Students were provided with a Likert-scale, ranging from one to extremely bad and five for extremely good. They could also choose “I have not done this” for each item. The bulk were given a neutral rating (between 2.5 and 3.5), with the exception of submitting assignments and checking grades/progress in the course.

Brightspace		
Navigating your course	3.30	
Using it on a mobile device	3.26	64.15% did not attempt
Finding content in the course	3.43	
Receiving announcements	3.25	
Submitting assignments	3.89	11.32% did not attempt
Checking grades/progress	3.56	32.08% did not attempt
Finding help online	3.11	49.06% did not attempt

Figure 8-12. Student satisfaction levels with Brightspace functions

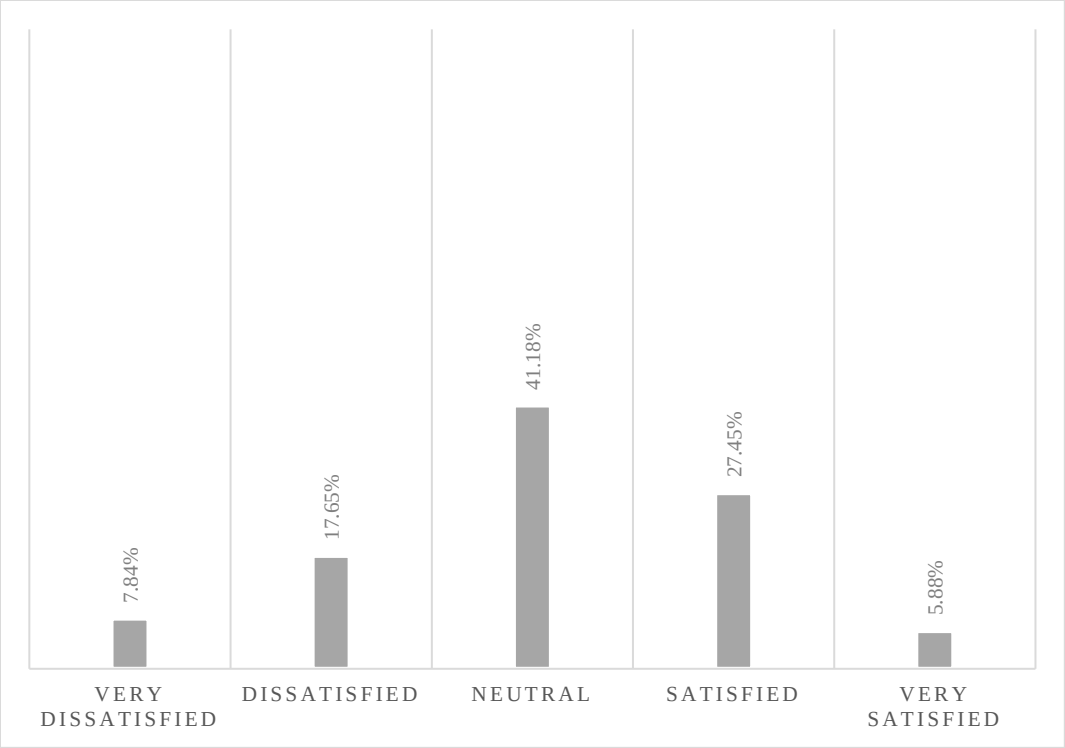

Figure 8-13. How would you rate your overall experience using the Brightspace pilot system? (All student responses)

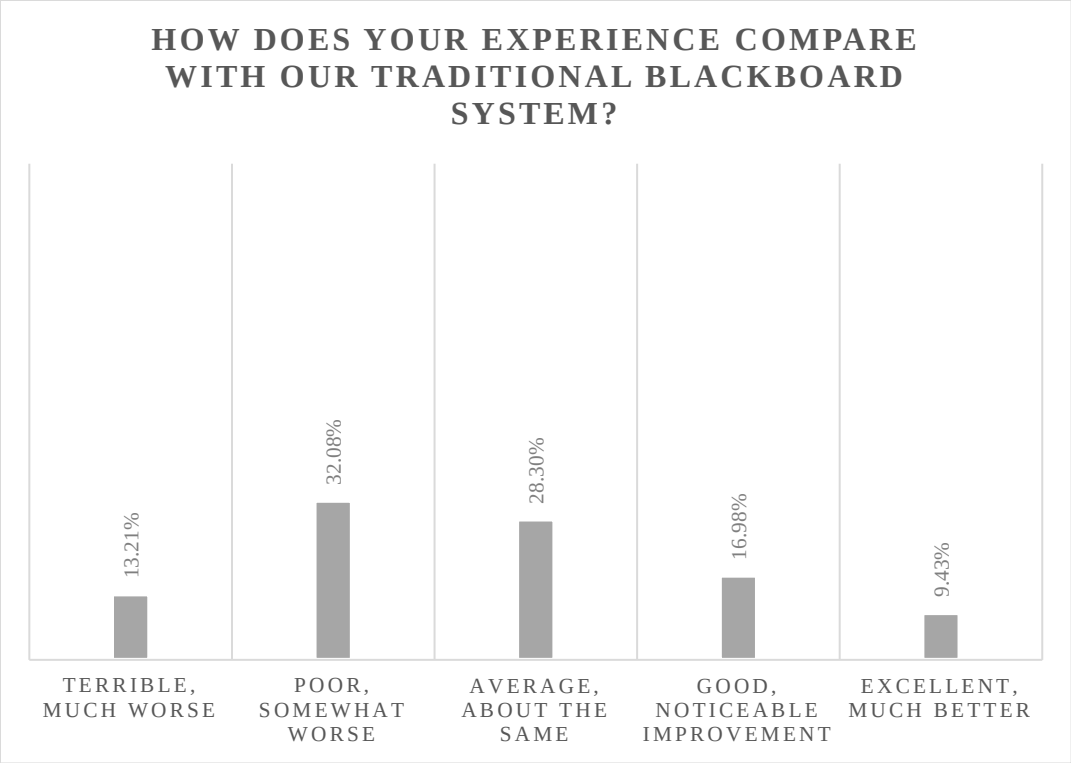

Figure 8-14. How does your experience compare with our traditional Blackboard system? (All student responses)

Canvas Student Survey

Summary: Overall, the majority of the 28.87% of students who responded to the survey enjoyed Canvas (57.70%). However, results were almost evenly split when we asked students whether Canvas was better, the same, or worse than Blackboard. When asked what they enjoyed most in Canvas, students responded by saying they enjoyed the updated interface as well as other features like the calendar system, and overall felt like it was easier to use. Not all students share this sentiment, and when asked what they liked the least some said it was difficult to navigate and they did not enjoy having to two different systems.

The Canvas student pilot survey had a response rate of 28.87%. Students were first asked to rate their overall experience using the Canvas system. In contrast with the other two pilot systems, who had a neutral rating, over half of the students (57.70%) said they were either satisfied or very satisfied. Out of the 42.29% remaining, 25.57% were neutral, and 16.72% were dissatisfied (Figure 7-17).

Students were also asked to compare their experiences in Canvas to our traditional Blackboard system. Student responses were split almost evenly between whether they felt it was the same (35.62%), felt it was an improvement (32.68%), or felt it was worse (31.37%) (Figure 7-18).

When asked what they like most about Canvas, responses varied between the modern user interface to specific features that worked well. Specifically, many of the students commented on

the grades section. For instance, “The grades are transparent and show the mean grades. It also is nice to be able to put in theoretical values and see the effect on the grade overall.” Other comments focused on the organization and appearance of Canvas. Students frequently commented on the “layout and ease of accessibility” along with how “the design is appealing.”

One student summarized by saying,

> *“I like how the site is structured. It is very easy to navigate and has a lot of great functions that could allow students to work in groups, communicate with other classmates, etc. that Blackboard does not really have much of. I absolutely love the calendar function that tells you when your assignments are due and crosses them out when you've finished- very helpful.”*

Students frequently cited the navigating of Canvas as being difficult. As one student explained, “I have no idea how to navigate it and click on random things until I find what I’m looking for.” Other students further explain that the “files” section was too disorganized, or that finding assignments was difficult. We believe this is because Canvas has a standard set of course areas that, by default, are left on for the students to see. For example, there is a button for “assignments” that, when clicked, will list every assignment for the course. One faculty member turned this off because they did not want students to be overwhelmed. Similar to the “assignments” area, the “files” section has a list of all the files in the course. These items can also be found under “modules”, but that is a different concept than Blackboard and may have been confusing for some students. As one student explained, “It’s harder to navigate than Blackboard, but that may be because I am more used to Blackboard.”

Additionally, many of the comments left by students were vague, “it’s hard to use” or “it’s not Blackboard” which made it difficult to ascertain the exact cause of their dissatisfaction.

Students were also asked to score their overall experience with different components of Canvas. They were provided with a Likert-scale, ranging from one to extremely bad and five for extremely good. They could also choose “I have not done this” for each item. Similar to Brightspace, the majority of students rated most areas with a neutral response (between 2.5 and 3.5), with the exception of receiving announcements, submitting assignments, and checking on grades and their progress.

Canvas		
Navigating your course	3.45	
Using it on a mobile device	3.01	41.45% did not attempt
Finding content in the course	3.28	
Receiving announcements	3.92	
Submitting assignments	3.97	
Checking grades/progress	4.08	
Finding help online	3.15	35.08% did not attempt

Figure 8-15. Student satisfaction levels with Canvas functions

Overall, when comparing the responses for each system side by Canvas scores higher in all areas except for using it on a mobile device and finding content in the course. When analyzing the

qualitative responses of students who gave Canvas a low score for the mobile device we found more comments about the overall organization of the course than we did about mobile usage. However, there were several qualitative comments that suggest students were unhappy that the website is not optimized for mobile use (Canvas has a dedicated mobile application available for download).

Student Survey	Blackboard Ultra	Brightspace	Canvas
Navigating your course	3.20	3.30	3.45
Using it on a mobile device	2.70	3.26	3.01
Finding content in the course	3.10	3.43	3.28
Receiving announcements	3.11	3.25	3.92
Submitting assignments	3.08	3.89	3.97
Checking grades/progress	3.22	3.56	4.08
Finding help online	2.92	3.11	3.15
total participants	51	53	305

Figure 8-16. Student satisfaction levels with LMS Pilot functions (Comparison)

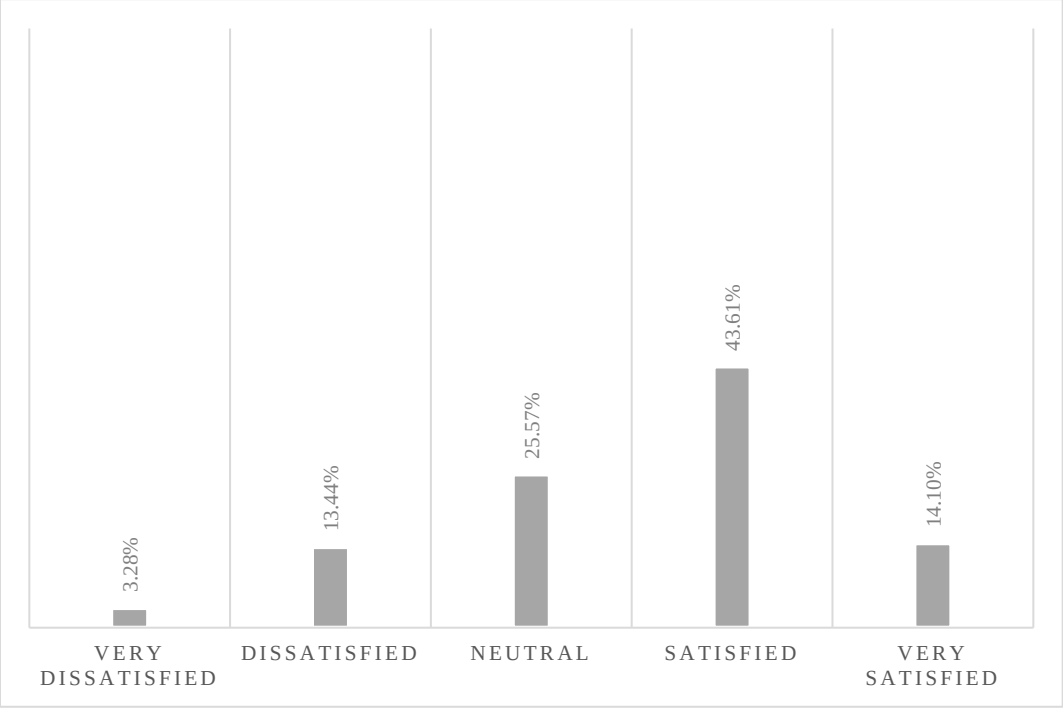

Figure 8-17. How would you rate your overall experience using the Canvas pilot system? (All student responses)

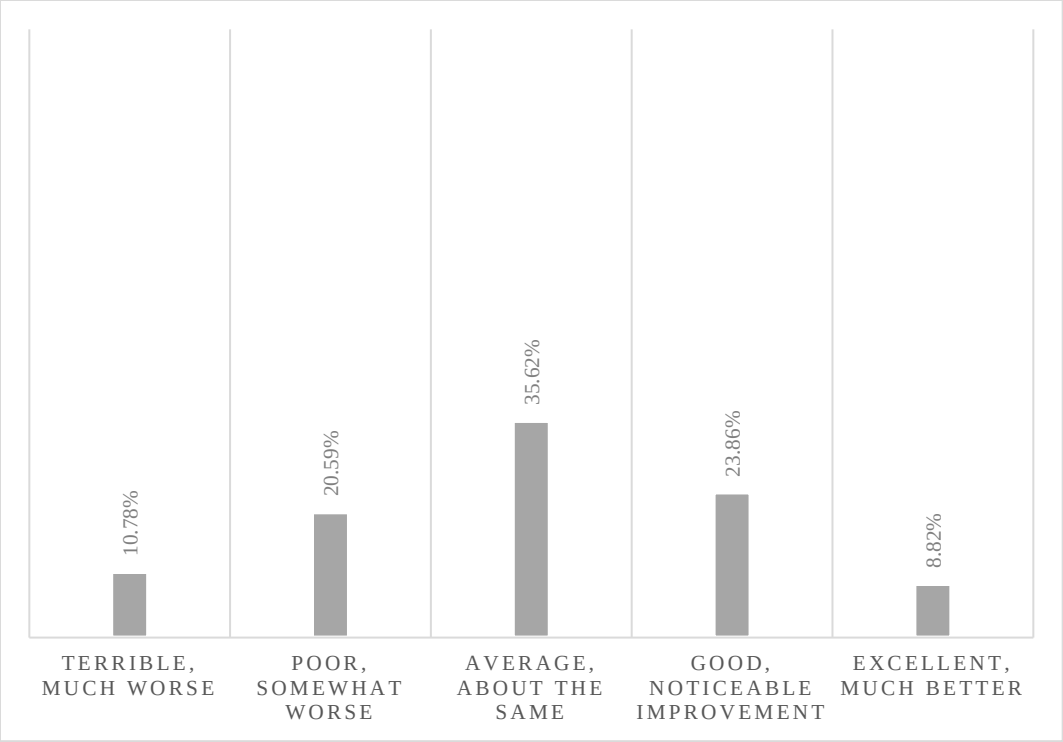

Figure 8-18. How does your experience compare with our traditional Blackboard system? (All student responses)

8.8. Support Feedback

In addition to feedback from faculty and students, we gathered feedback from the team members who provided support during the pilot semester. The evaluation team began using the pilot systems in the spring and summer of 2017, with on-site training provided by Canvas and Brightspace.

The following is a summary of feedback for each system, written by the instructional designer who supported each LMS during the pilot semester. It touches on course creation, maintenance, and other additional comments that the instructional designer felt pertinent to the pilot experience.

Blackboard Ultra Summary: When converting courses to the Blackboard Ultra experience, not all content may transfer properly. For some courses, the number of issues was substantial (around 50). For users who want to create a course from scratch, the process is intuitive with few clicks. The streamlined version of Blackboard Ultra is based on a file repository system. It would work well for faculty members who want to display content but not for faculty wanting to use other tools such as peer review. In our testing, and during the pilot semester, we found that some functionality is not yet optimal. For example, instructors should be able to place PDFs inline, however, that does not work for anyone using a Chrome browser. This may be updated by Blackboard in the future, as Blackboard has plans for adding more features to the Ultra experience on an ongoing basis.

There is no functional difference between the current Blackboard system used at Cornell and the version piloted during the evaluation. Therefore, the following feedback focuses on the new streamlined course experience of Blackboard Ultra.

Course migration. There will be some issues converting courses from our instance of Blackboard into Blackboard Learn, Ultra. In one course copy, there were over 50 issues reported, which might alarm some users. The following are two examples of errors that occurred while converting a Blackboard course into a Blackboard Ultra course:

- The folder description was shortened or lost formatting. As a result, the user had to revisit their original Blackboard course to copy over the descriptions.
- Files that were added as attachments are grouped together in alphabetical order at the end of the content.

We may be able to organize a workflow out of Blackboard that reduces these copy issues.

Course creation (from scratch). Course creation from scratch is improved from earlier versions of Blackboard as adding content can happen with fewer clicks. Dragging and dropping is easy for rearranging content. The structure is based on a file repository system. There are a few different ways to upload content. This could be confusing for some because things display in specific ways that might not be easy to grasp right away. For example, a user can upload and place an inline image into a content folder or into a New Document but only if it is attached to the New Document. An image uploaded as a file directly will show the image icon and open in a new window when clicked. There can be no inline images in the top-level file directory. PDFs can reportedly be placed inline if the browser allows but Chrome was not allowing, so students would need to download items. Assignments and tests are present in a simplified way.

Other comments from the Instructional Designer. Ultra is meant to be a drastic redesign from traditional versions of Blackboard, and it is. It is smooth, clean and minimal in features and design. If faculty want an LMS that is not weighed down with a lot of clunky tool baggage this would be a good starting point. Likewise, if faculty want to share content and serve simple tests and assignments Ultra would be suitable. However, for other faculty, those that are looking for ways to enable the sharing of student content with one another, or for students to see and comment on one another's work (or who might want to move away from the repository style of learning sites and into more contemporary webpage-like environments), Ultra may not meet their needs. Its collaborative tools are limited to a chat feature (with individual students or the whole class). Users still need to link to a collaborative document (such as a Google doc). There is also the potential for the file system becoming unorganized quickly as faculty upload content. Content may get lost, and with no search or location to simply see what files have been uploaded (users must instead browse through all the content) this could become confusing for students.

Blackboard Ultra is simple, but it takes planning. Despite the similarity with Blackboard Learn, users will likely need additional support.

Brightspace Summary: Most courses would import easily into Brightspace, but courses with a lot of content, quizzes, or using other advanced features may need additional assistance. Because Brightspace is structured differently than Blackboard, it is expected that more support would need to be provided to faculty. For example, when an assignment is created, a column in the Grade Book is not automatically created, unlike in Blackboard. This might be confusing for faculty who are accustomed to Blackboard. Brightspace has a sleek modern interface. In addition to having a mobile application, their website is optimized for mobile usage and can be used on tablet devices and phones. Although the largest pilot course only had fifty students, Brightspace has the ability to support large courses. Their permission system is so granular that special roles could be created that would limit TAs to their sections.

Course migration. D2L prides itself how easy it is to migrate course content from Blackboard into Brightspace. The system does a good job ingesting course content from Blackboard. Courses that have a simple design and basic content, such as documents, images, and web links are more successful than more complex courses that might include content such as quizzes, course modules, and question banks. This type of content may need to be recreated. The larger issue is organization. Because Brightspace is structured differently from Blackboard, in many cases imported content would need to be reorganized and a new structure created or re-created. For courses with a large amount of content, this could be daunting for a faculty member as it was for some in the pilot. Thus, although Brightspace can import most content from Blackboard, significant staff support from the Center for Teaching Innovation would be required to help some faculty create or re-create their course in Brightspace.

Course creation (from scratch). Creating a new course in Brightspace is not difficult and the system is highly customized to meet instructors' needs. Some instructors who piloted Brightspace require no help from CTI staff, although most required at least some assistance. Brightspace allows instructors to drag and drop content onto the LMS from an instructors' desktop as well as between areas within the LMS. However, because the structure of Brightspace is quite different from Blackboard, support by the instructional design/support team might be necessary for faculty who have become accustomed to Blackboard. This is particularly true when creating assignments and using the grade book. When an assignment is created, a column in the Grade Book is not automatically created, unlike in Blackboard. Creating a column requires an extra step and it is possible to create assignments without ever creating a column in the grade book. Some in the pilot found this confusing.

Other comments from the Instructional Designer. Brightspace has a sleek design with a modern interface and many intuitive features. Although there is a mobile app, the entire LMS has a responsive design and it works on tablets and phones. It integrates with all third-party applications currently used at Cornell through LTI integrations. There are no building block integrations with Brightspace so many 3rd party integrations are not as closely linked as with the current version of Blackboard. During the pilot, the largest class to use the system was around fifty students, although some in the pilot did have sections and TAs. As a result, we have

limited experience with how the system works with very large classes with multiple sections and TAs. However, Brightspace is very customizable and it is possible to give Teaching Assistants access to specific sections and limiting access to other TA's sections, including limiting Grade Book access. As mentioned above, creating assignments in the Grade Book is quite different from Blackboard. If a move to Brightspace is made, it is very likely that CTI would need to spend significant time helping faculty understand how to create assignments and use the Grade Book.

Brightspace has a robust set of analytic tools to track student progress. This includes information on how long content has been viewed by individual students as well as other types of analytic information on how students interact with content. Because of the customizable nature of Brightspace, it is possible to create course templates on the college or department level to provide a uniform student experience in the LMS if that is desired. From a structural standpoint, Brightspace is quite different from Blackboard. If a switch were made, CTI staff would likely spend significant time working with teaching faculty and staff to navigate the new system and transfer content. Brightspace support staff were very helpful.

Canvas Summary: Copying courses from Blackboard to Canvas can be time consuming. Most courses transfer easily. Courses may make use of advanced functionality or have an extraordinary amount of course content may want to recreate their course in manually in small increments. Maintaining courses in Canvas is relatively maintenance free for most courses. Canvas utilizes its open code to provide institutions the ability to create additional features or functions that are not already available in Canvas. However, Cornell would have to devote resources to creating and maintaining it, if not already created by another institution.

Course migration. Most courses transfer easily unless they have a substantial amount of content or utilized advanced features. In all other instances, it is recommended that pieces of the course be copied incrementally from Blackboard into Canvas. Incremental copying will circumvent problems with bulk importing and encourage the instructor to think about the course design modifications. Adoption of templates and/or dedicated instructional design support to help with the process of migrating from Blackboard to Canvas is highly recommended.

Course creation (from scratch). This process can be used to leverage backward course design[4] when building a new course in Canvas. The module-based Canvas system can be used to encourage faculty to think about their desired learning outcomes and how best to facilitate them with the LMS. Building new content in Canvas is very user-friendly. Building an advanced grade book with nested weighted grades requires substantial support from our instructional design/support team. Additionally, Canvas does not have "smart view" functionality that is

[4] Backwards course design is a framework for designing courses that begins with identifying the desired results for the course. The second step is to outline what evidence would be needed to determine learning was achieved. Once the first two steps are completed, the final stage is to develop the learning experiences and instructional strategies (such as discussions, lectures, etc.).

available in the Blackboard grade center, which is extremely helpful for large classes to filter the display to specific users, graded activity, or both. At this time, this is not possible in Canvas, and in large enrollment courses, this may be frustrating to faculty who want to view specific information. However, if the course has managed section enrollment, instructors are able to filter by sections.

Other comments from the Instructional Designer. Canvas is perceived as having a more modern look and feel. In the pilot, it posed significant challenges for two large enrollment courses. There was a technical bug identified with the SIS integration to Canvas, which prevented successful un-enrollment for students who had dropped courses. This only affected courses with over 150 people. Additionally, one large course found the peer assessment rubrics and delegated grading to be limiting. They also missed the "smart view" functionality that is available in the Blackboard grade center but not in Canvas. LTI of third-party tools such as Turnitin were not as effective when compared with the building block supported versions of the same third-party tools in Blackboard. Canvas leverages its open source code to allow institutions to customize features and functions of the LMS. However, this requires additional support to develop and maintain the code. Additional customization can also be obtained by tailoring which tools and access levels are turned on for the campus and/or specific college (e.g., CVM), but would need to be coordinated with technical support, and the registrar.

8.9. Vendor Relationship

As each of the learning management systems varies, so too does the relationship with each provider. In general, each LMS company issues a primary contact that works with the relationship manager from Cornell. Additionally, each provider has a support ticket system that Cornell administrators can use when needed. The specifics of how each work varies depending on the LMS.

The following is a brief discussion on our current relationship with Blackboard and the connections we have forged during the LMS evaluation.

Blackboard. Cornell has been using the Blackboard learning management system since the original CourseInfo version was introduced in the mid-nineties. The Blackboard system was co-created by two Cornell graduate students. Over the years, Cornell and Blackboard have maintained a healthy working relationship. Under the current support model, when issues arise, the Cornell support team submits a case ticket to Blackboard support. Depending on the severity of the issue, the ticket is assigned to the appropriate support tier at Blackboard and updates are provided. When needed, the support team can work directly with an assigned customer support representative. Blackboard also has a strong user community that has been working together for many years via mail lists, weekly system admin calls, and a community website hosted and supported by Blackboard that includes customer participation by faculty, administrators, and instructional designers. The site also facilitates design and bug fix priority voting.

Brightspace by Desire2Learn (D2L). In existence for almost as long as Blackboard, D2L has a similar support methodology. If Cornell were to transition to Brightspace, a relationship manager from Cornell would work with the contact person to build the relationship, while the support team works with the support personnel at D2L for any advanced technical issues that occur.

Administrators also have the option of calling a 24/7 helpline for support assistance. Brightspace has its own community. The community allows for any user (instructors, developers, admins, and learners) to access help documentation and take part discussion groups. Additionally, Cornell would be a very prestigious, high-visibility client for D2L.

Canvas by Instructure. A relatively new company, Instructure has adopted the standard support method of providing a primary contact person along with a support portal for Cornell administrators. As with D2L and Blackboard, a Cornell relationship manager would work with a contact person from Instructure while the support team uses a ticketing system for advanced issues. Administrators also have the option of calling a 24/7 helpline for support assistance. Instructure offers written help documentation for the Canvas platform, but there is even more provided by fellow users (faculty, administrators, etc.). Additionally, development of the LMS is driven largely by requests for the community. Faculty members, administrators, instructional designers, each have the ability to participate in the Canvas community and suggest new ideas, which are then voted on by users across all institutions using Canvas. If it receives enough votes, it moves into a development phase.

8.10. Conclusion for the Pilot Analysis

Blackboard Ultra.

Blackboard, originally called CourseInfo, has been at Cornell since the mid-nineties. The relationship forged over the years continues to be healthy. Originally, it was our intention to evaluate the new streamlined Ultra interface. Blackboard Ultra is streamlined and does not have all of the features that our current Blackboard Learn platform has. However, development continues. Due to the inability to test the new streamlined Ultra experience, we did not conduct a full pilot of Blackboard's new system. Other than an updated interface appearance, the only functional change between the two Blackboard systems is how third-party integrations are performed. Faculty and students piloting the updated interface appreciated the modern look but otherwise thought their experience did not change from traditional Blackboard. In several cases, due to third party integration changes, faculty preferred the current Blackboard.

Brightspace.

The majority of Brightspace faculty felt their Brightspace experience was about the same as their Blackboard experiences, and in the future would prefer to use Blackboard because it is what they know already. Faculty felt that adding content to Brightspace was easy, and enjoyed the clean modern interface. However, once content was added to the course they struggled to navigate the Brightspace system to create assignments or use the grade book. The frustration from faculty was felt by the students, who reported their Brightspace experience as neutral but would prefer to use Blackboard in the future. Due to their frustration with the basic functions of Brightspace, supporting Brightspace would initially require more support and training for course instructors, technical staff, and academic support.

Canvas.

Faculty and students in the pilot enjoyed using Canvas and many suggested they would prefer using it in the future instead of Blackboard. Overall, Canvas would work well, likely better, for most faculty and students, but it might not for some larger classes (over 150 students) or for faculty with specific use cases. One example of this is the grade book, which lacked some features that were needed by users (faculty did not give a lot of weight to this issue in the interviews and most were still satisfied with their experience). Faculty members with advanced or specific requests would require more support. However, Canvas could require less support for everyone else. It is important to note that, in Blackboard, additional support is already provided for faculty who push the boundaries of the LMS. Conversely, in Canvas, due to the built-in functionality, those boundaries are automatically set wider which may result in less support needed for the majority of faculty. Features and functions that are currently unavailable in Canvas may be achieved via API, however, Cornell would need to devote resources to maintaining (and potentially developing) any custom functionality.

9. Requirements Analysis

During the 2016-2017 academic year, the LMS Evaluation team completed a requirements analysis of Cornell's current Blackboard system (Learn 9.1), Blackboard Ultra, Brightspace by Desire2Learn, and Canvas by Instructure.

The requirements analysis had two main goals:

1. Identify the features and functions desired by the Cornell teaching and learning community.
2. Explore the ways in which each of the evaluated learning management systems satisfies identified requirements.

The following section includes:

- An analysis of the LMS Features and Functions identified as desirable from Faculty and Students.
- A requirements comparison of each LMS, analyzing 15 different functional areas.

9.1. Features and Functions

Summary: The faculty and student surveys provided a wealth of knowledge and insight into what features and functions the Cornell community values in a LMS. Results from the surveys show that faculty and students both put the same emphasis on basic functionality: content, grades, announcements, and assignments.

In the spring of 2017 faculty survey, participants were asked what features/functions they would like available while *building* their course, and what features/functions they want while *managing* their course (more information from this survey can be found in the Faculty Survey analysis portion of the report). It is important to note that these are features faculty want to use, but may not be using currently. Participants could check as many features as applied to them.

To evaluate their preferences, we tallied the number of times a feature was selected. Results found that the first five features most desired by Faculty are basic LMS functionality. Notably, features six through ten are methods of student collaboration and engagement strategies.

In order, the following is a list of the top features faculty indicated as being most desired:

1. Adding content to a course
2. Sending announcements and emails
3. Collecting students online submissions
4. Uploading videos
5. Calculating grades
6. Facilitating group work
7. Configuring and facilitating discussion forums
8. Using collaborative tools such as peer assessments and wikis

9. Synchronous video conferencing
10. Classroom learning analytics

In a related approach, the student survey prompted participants to identify any tools or features that best contribute to their learning (more information from this survey can be found in the Student Survey analysis portion of the report). Like the faculty, the majority of students identified basic LMS functionality, including easily finding content (such as lectures and pdf), checking grades, viewing announcements, and accessing assignments (both uploading and viewing them by category). This echoes roundtable discussions and information sessions, where students also discussed a desire to have functionality that easily allows for collaboration with their fellow students.

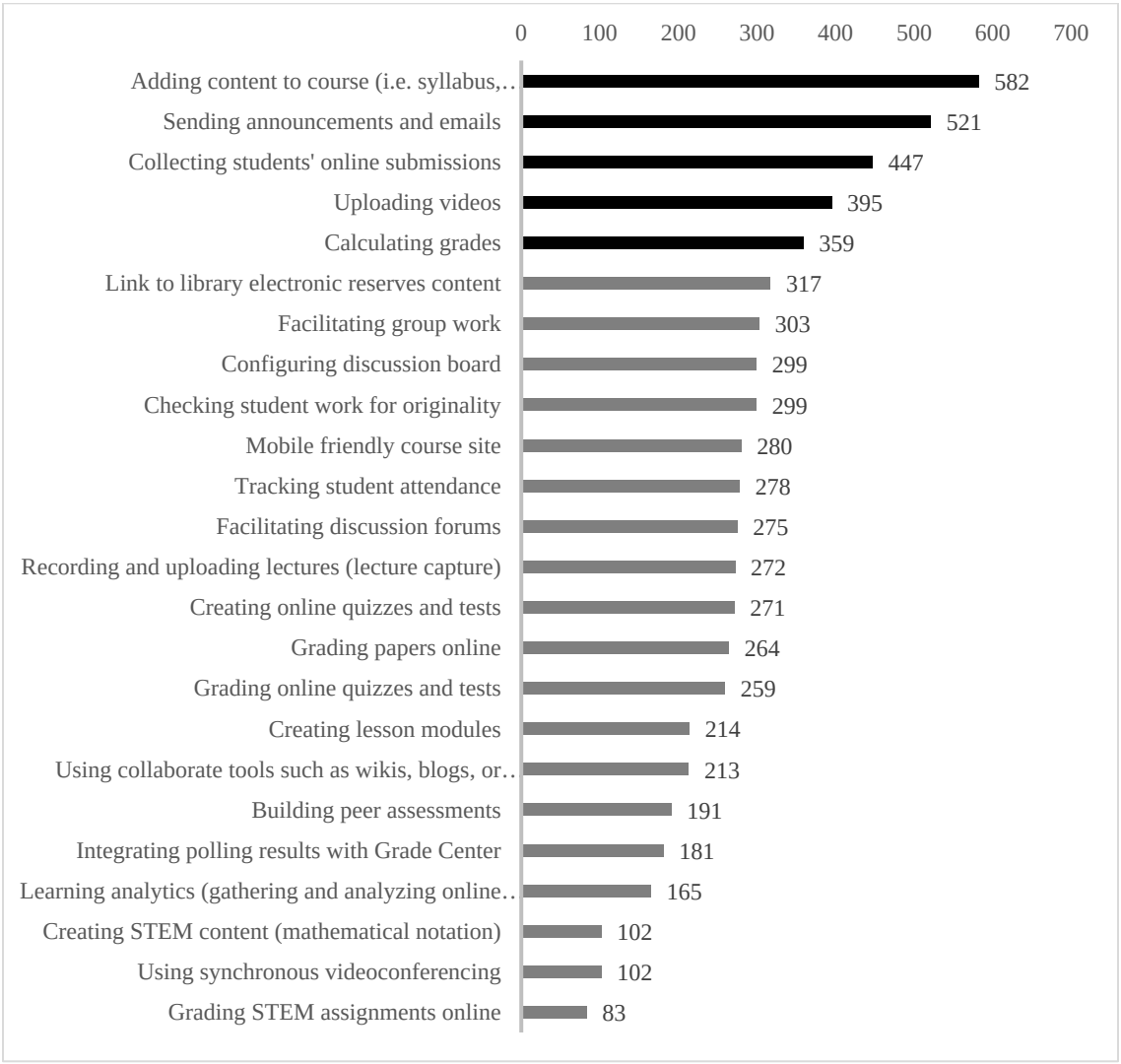

Figure 9-1. Feature Desirability (All faculty survey responses)

9.2. Requirements Comparison

Summary: In general, all of the learning management systems have the same basic functionality. The major differences between the LMSs are in the user interfaces and the advanced tools offered. For example, Blackboard Ultra is a clean streamlined system that currently does not have all of the tools available as the other LMSs. Canvas and Brightspace both have tools available not found in Blackboard Learn. Brightspace offers an instructional design wizard, which enables instructors to build their course while aligning it to learning outcomes. Canvas offers an intuitive modern interface and features a grading tool called SpeedGrader, which provides inline grading and feedback in a streamlined grading process. Details that are more specific can be found below in the conclusions section of this requirements comparison.

One method of evaluating learning management systems is to outline the features and functions of the current system being used, and identify what is different in the pilot systems. However, this does not take into consideration what faculty and students actually want from their learning management system.

Instead, to evaluate what LMS would work best for Cornell, we compiled a list of desired features as identified by faculty and students. This was achieved by generating over 200 requirements, categorizing them into functional areas, and writing a review of each area per LMS. The following is a detailed description of our methodology and the results of those reviews summarized per learning management system.

To identify the wants and needs of Cornell's teaching and learning community we spoke to various stakeholders and groups across the Cornell campus. At each meeting, notes were taken, with specific attention paid to what participants wanted to achieve when using an LMS. This includes what they currently do (in any LMS) and what they wish they could do but are currently unable. Using these notes, and the features and functions review (detailed above), a comprehensive list of over 200 requirements was created by the evaluation team.

After reviewing the list of requirements, they were categorized into fifteen different functional areas.

- 3rd Party Integrations
- Activities and Tools
- Quizzes
- Assignments
- Discussions
- Course Content & Group Management
- Peer Review
- Synchronous Tools
- Communication
- Content Management
- Grading

- Reporting and Analytics
- Learning Goals
- Mobile
- User Experience

Each instructional designer, who specialized in the specific pilot LMSs, wrote reviews for each category to outline how each LMS did or did not fulfill the requirements[5]. In order to ensure accuracy on our part, the reviews were sent to the LMS vendors[6]. Each vendor had three weeks to respond. Not all comments from the vendor were incorporated into the reviews, only those that helped to clarify initial statements.

A side-by-side of the reviews can be found in Appendix N, which includes Blackboard Learn, Blackboard Ultra, Brightspace, and Canvas.

9.3. Conclusion for the Requirements Analysis

In general, all of the learning management systems have the same basic functionality, such as uploading content, creating assignments, grading, and communicating with students via announcements. The major difference between each product is in the workflow and user experience. Every LMS requires a different path, or workflow, to upload content, add a quiz, and perform other course design and maintenance functions.

The following conclusions highlight the main differences between each product.

Blackboard Learn.

Overall, Blackboard Learn meets most of faculty and student's needs. It stands apart as the only LMS to offer built-in tools for blogs, wikis, and journals. Not all faculty members currently use the built-in tools, with many opting to utilize a third party product to accomplish their goals. Blackboard Learn also allows for building block functionality allowing for deeper integrations with tools like Turnitin. If Cornell were to switch to another LMS, there would be a change in how assignments are set up. Additionally, Blackboard Learn offers a unique grading feature called "smart views", which enables instructors to create their own pre-defined views of the grade book. This is enormously helpful in large courses with a great deal of content or many students. Similar to Brightspace, Blackboard Learn also supports explicitly linking learning outcomes to activities. However, learning outcomes must be added by an administrator and cannot be added by an instructor. Students have a limited ability to personalize their interface. Instructors have the ability to customize the course design and navigation. However, many faculty find the Blackboard Learn user experience is generally not intuitive and many functions require multiple "clicks" by the instructor to setup.

[5] Reviews for our current system, Blackboard Learn, were also included.
[6] Vendors only received their own reviews.

Blackboard Ultra.

In its current state, Blackboard Ultra will meet requirements for faculty who use the LMS for storing documents and those who want basic assessment and collaboration tools. Although Blackboard continues to add features, at the time of the pilot semester, they were not released. In the future Blackboard intends on adding a Google Doc integration, and currently integrates with Dropbox. At this time, Blackboard Ultra's quizzing functionality is limited to multiple choice, true or false, and essay style quiz questions. Blackboard Ultra has a fully functioning grade book. However, it does not currently have delegated grading or anonymous grading (although there are plans for that in the future). Unique to Blackboard Ultra are discussion board analytics that provide a grade suggestion to instructors. Other embedded analytics were added after the pilot semester concluded. Blackboard Ultra is limited in its group or collaborative work offerings. Group work can be done synchronously via Collaborate, but there is no dedicated group work "space." There is an option for students to have "conversations" about the content, which functions similar to a chat tool. Blackboard Ultra is optimized for mobile use and has a mobile application. Currently there the only option for displaying content is in a scrollable vertical list, resembling a file repository. Overall, Ultra's interface is clean, well designed, and easy to navigate. This product continues to evolve as Blackboard adds new features. On 1/12/2018, Blackboard Ultra released version six of Ultra, which included some additional features. However, this was released after the pilot semester was over and therefore, was not tested.

Brightspace.

Unique to Brightspace is its "Instructional Design Wizard" that can be used to help instructors develop learning goals and outcomes and align them to assessments and content. All Brightspace assessments have a learning objective attached to them, although instructors are not required to fill in this section. Additionally, Brightspace offers a Google doc integration, although it was not enabled for the pilot semester. During the pilot, the LMS did not offer built-in wikis, journals, blogs, or peer review. However, after the pilot concluded Brightspace implemented a peer review tool, since it was added after the pilot it was not fully tested. The grade book in Brightspace is set up differently than the other LMSs, which may cause confusion for some faculty. However, they do have an additional package called Critique^IT which allows faculty to perform in-line annotation and commenting on student submitted documents[7]. Brightspace offers the ability for students and faculty to record audio or video responses directly through the LMS interface. This can be done for at location where a student or faculty member can leave a text comment. When copying a course into Brightspace, faculty can batch update assignment due dates. Assignments are automatically listed on a calendar. Instructors are able to easily drag and drop content into the system, and can organize content via drag and drop. As with Canvas and Blackboard, Brightspace's API can be utilized to create other tools. The Brightspace learning environment is a different concept from Blackboard and Canvas. During the pilot semester faculty felt it was unintuitive to setup and many of the functions required multiple "clicks".

[7] This was not turned on for the pilot semester.

Canvas.

Canvas's open code and open API makes it possible for institutions to create their own custom integrations with Canvas. However, this would require additional resources for development and potentially for support. Canvas does not have a built in wiki, journal, or blog posts but suggests using their ePortfolio tool for journals and blogs. Additionally, as with any of the other learning management systems, faculty can use a third party tool for wikis, blogs, and journals. When uploading assignments, instructors can limit what type of files students can submit. Once submitted, instructors can use the SpeedGrader tool for in-line annotation, comments, and to grade. The current Canvas quizzing tool, which has all of the basic functionality, is in the process of being updated. Similar to Brightspace, Canvas allows users to upload video and audio content. This can be done in multiple areas, including discussions. When creating a course, instructors are able to batch update assignment due dates. These due dates are reflected in a calendar. Instructors can also create events and sign-up forms on the calendar. This could be used to sign up for office hours. Instructors cannot upload content via drag and drop, however once the content is in a Canvas module, it can be rearranged and organized via drag and drop. Canvas offers a mobile application, but its website is currently not optimized for mobile use. Instructors have the ability to customize course design and content, but they cannot directly alter side toolbar names. Overall, interface is intuitive and does not require multiple “clicks” by instructors to setup.

10. Technical Analysis

This section of the report focuses on the technical implications of migrating and maintaining the three proposed pilot systems, Blackboard Ultra, Brightspace, and Canvas. It also includes a review of the accessibility capabilities of each LMS vendor.

10.1. Technical Analysis Goals

To help assess the implications of transitioning to a new learning management system, a team drawn from the Center for Teaching Innovation and Cornell Information Technologies performed an evaluation of the technical areas and the implications associated with transitioning to any of the three pilot systems.

The technical implementation team was involved in every stage of pilot implementation and had been tasked with executing authentication, SIS integrations, user role customizations, and other administrative tasks (see attached Appendix O for a detailed breakdown comparison by the system).

The following analysis is broken down into three main components:

1. A brief discussion of why the technical area is important.
2. The **one-time migration** considerations that would need to be made if Cornell chooses to switch from its current system, Blackboard Learn.
3. The **ongoing technical** implications of transitioning to any of the three pilot systems.

Below is a diagram depicting how each of the technical areas interact with each other (Figure 10-1). Each area in the diagram is explained the following analysis. In the figure, B2 represents Blackboards building blocks, or plug-ins. LTI stands for Learning Tools Interoperability and represents an industry standard integration method.

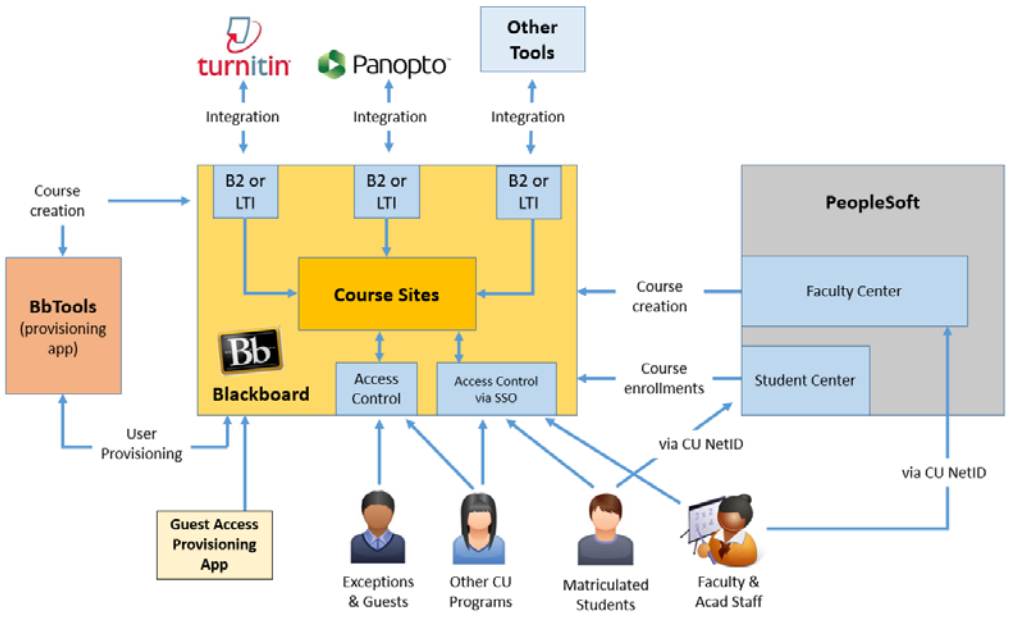

Figure 101. Technical diagram depicting the LMSs connections with other systems

10.2. Technical Areas

One-Time Migration Considerations Summary: The one-time change would require initial configuration to any system chosen. All LMS systems reviewed provide adequate support for key requirements, though in some cases we may need to invest in developing viable alternatives to any lost functionality. The most extensive investment of time and resources would require engaging PeopleSoft developers in order to make changes to the current SIS integration and remapping existing business practices. This would not be required for Blackboard Ultra.

Should Cornell choose to migrate to a different LMS, it will be necessary to continue to maintain Blackboard during the transition. This involves providing support for the existing integration with the PeopleSoft system as well as other third-party vendor plugins.

Ongoing Technical Implications Summary: The pace of changes to web technologies presents a challenge to any system. When the LMS includes integrations with third-party tools and content providers, it requires updating these integrations as well as the LMS. The systems that allow for a more streamlined integration would be easier to support. Vendors who developed good working relations with other tool providers would be more reliable. The third-party developers would have prior knowledge of changes and would have time to update and test their LMS plug-in integrations. Most web tools and content providers work very closely with Blackboard, Canvas, and Brightspace. However, lately, tool providers focus more on Canvas and Blackboard than Brightspace for their integrations.

For day-to-day ongoing support, Blackboard or Canvas would be less complicated to support than Brightspace. For example, currently, we can accommodate special use-cases in Blackboard. In Brightspace, this would require vendor intervention.

Each system was analyzed across several key technical areas, described below. This is not intended to be an exhaustive technical itemization, but an overview of key technical considerations.

Authentication

Access to the LMS system should be controlled through authentication. It is important to remove unnecessary barriers to access. For example, users should not need to have a separate account and password to access the LMS. Therefore, LMS access should use the same username and password as the Cornell NetID. However, it should also allow access to non-Cornell approved users. This is important for extension programs, visiting scholars, and affiliates. Currently, there are a handful of courses on Blackboard that are offered for Cornell Weill students and courses for extension programs; this requires that Cornell Weill ID’s and non-Cornell accounts can be supported as well.

One-time migration considerations: All systems will support Cornell NetID accounts. They all support Single Sign-on (SSO SAML) authentication. All systems also allow for local accounts which would accommodate access to users who do not have a Cornell issued NetID or Weill ID.

Currently, Weill users must create a separate password for their Blackboard account login because Blackboard does not support more than one identity provider (SAML). Canvas, on the other hand, does support multiple SAML providers, making it possible for Weill users to log in using their Weill accounts (CWID). Brightspace does not support multiple SAML providers.

The existing custom application that is used to create non-credit bearing courses and accounts would need to be modified for use with the new LMS. This can be accomplished using supported secure data transfer protocols (see the **Integrations with third party vendors** section below). Blackboard Ultra could continue using the existing Web Services application.

Ongoing technical implications: Once access management (authentication) is configured for an LMS, the only ongoing considerations is the account provisioning process. This is not a problem for any of the systems piloted.

Roles and Permissions

The LMS should allow an institution to configure user roles and permissions to set what users can and cannot do. For example, currently, Blackboard allows us to set administrative roles, course or organization roles, and institutional roles. Administrative roles allow users to manage the system, third-party plug-ins, users and course creation, authentication configurations, etc. Course roles control access to content and tools within a course. An “Instructor” role would allow the user to add content and grade assignments where a user with “Student” role would be restricted to viewing content and submit assignments but would not be able to add content to the course. Institutional roles control what organizational-level information users see. For example, currently, users with a “Faculty” role can see notices that pertain to Cornell Policies and Guidelines, aimed at the faculty audience, where students do not see this information.

One-time migration considerations: As with the current Blackboard system, all learning management systems that were piloted allow us to modify existing admin and course roles and to create new custom roles in the system. This allows user permissions to be restricted to specific functions within the system (for system admin and support roles) and at the course level (Instructor/Teacher, TA, Course Builder, etc.). Currently, several custom course-level roles are in use in Blackboard such as Admin Assistant, Reviewer, and Undergrad TA. For example, a user with a role of Undergrad TA cannot access the full grade center but has the ability to grade Turnitin assignments, discussions, and blogs. In Canvas, however, it is not possible to control permissions on the same level of granularity the other two systems allow. For example, we were not able to configure the same Undergrad TA role in Canvas. In Brightspace, this customization is possible.

Ongoing technical implications: Once the permissions are established, there are no foreseeable ongoing issues. Theoretically, if business needs change, it would be advantageous to have a system that is flexible enough to meet future requirements.

Integration with University student records (SIS)

The LMS system must integrate with student information records (maintained via PeopleSoft). This integration is required to facilitate the creation of accounts, courses, and enrollments. Currently, each semester, faculty request sites they want to be created in Blackboard through a custom-designed interface in the PeopleSoft Faculty Center. These requests are batch processed several times a day and enrollment add/drop is updated throughout the semester. This integration facilitates compliance with Copyright guidelines and reduces administrative tasks for faculty and academic support staff.

One-time migration considerations: Student Information System (SIS) integrations are used to integrate user, course, and enrollment creation from official registrar records.

All LMS options allow for SIS integration so that course enrollments can be linked to official class registrations. All systems allow managing changes to class enrollment using an SIS integration with the registrar system (PeopleSoft). With any system, the data has to come from the registrar properly formatted to meet specific LMS requirements.

Brightspace has a slightly different process, which requires that we collect not just current enrollment, but all dropped enrollments. The course creation process requires categorizing courses into predefined Brightspace "Templates." All SIS data must be uploaded to the vendor provided FTP site to be processed on a pre-set schedule. This limits our flexibility.

Currently, Blackboard allows for more integration flexibility in controlling course creation and enrollment. Brightspace and Canvas options for managing exceptions would need to be explored in greater detail and would require time for discovering and developing a solution.

In order to continue support for integration with the registrar's student information system, extracted data that is required to create users accounts, courses, sections, and enrollment must be reformatted to meet a new system's requirements. This would require a cross-divisional resource effort and coordination. A new process for supporting automation of the data feed and processing the data must be developed. In addition, a new course creation notifications application must be created. This requires skilled resources to develop, test, and place a solution in production.

Gains that Canvas and Brightspace offer include the ability to create sections within courses. For example, students who take Chem 2080 register for a lecture, lab, and discussion section. When a course is created in the LMS for Chem 2080, separate sections would be created for each discussion and/or lab. This allows the instructor of the course to restrict grade book access to a TA who is leading a specific section only.

Accommodating this change would require that we collect additional data for each course which includes sections or class sub-components and enrollments by these class sections. To implement this would require PeopleSoft developers working with the registrar. This may also involve changes to the course request process affecting how faculty and their departments request courses.

Ongoing technical implications: The integration with SIS requires effort to maintain. Each new semester, the terms would need to be defined and integrations for each term need to be

configured. Any errors with integration must be promptly resolved. This may require effort across multiple divisions. Any changes to PeopleSoft requires testing and possibly changes to the integration process. This is the current practice with the existing Blackboard system.

With Brightspace, we would have to engage the vendor if we need to make changes to the scheduled integrations. This limits our flexibility to address any unexpected changes.

Integrations with third party vendors

The LMS must support the integration of external applications that provide additional functionality. For example, an integration with Turnitin allows faculty to check students' work for originality, and the ARES integration allows faculty to link Library course reserves content with their course in the LMS. Kaltura and Panopto integrations allow faculty and students to create and interact with media content in the course.

One-time migration considerations: Being able to augment the functionality of the LMS system and provide secure data transfer requires that it support industry standard integration protocols such as SOAP[8] or RESTful APIs[9]. For example, we currently make use of the Blackboard API to add/extend functionality with self-service web tools to request custom course creation, custom user account creation, and to provide notifications when courses are created.

Blackboard and Canvas support RESTful APIs, Blackboard also supports SOAP and Blackboard Building blocks, which are developed specifically for Blackboard by other 3rd party learning tools such as Turnitin, Kaltura, textbook publisher tools, etc. At this time, Blackboard building blocks provide a more direct integration of the LMS with the many of the third-party learning tools.

Brightspace has a REST-like API that comes with an available software developer kit (SDK) for different programming languages. Installing third-party integrations with Brightspace is more involved than with the other two systems. It is a multi-step process that involves tool configuration and adding tool permissions for users in the system.

Here is an example of how a Turnitin integration would differ across systems:

Currently Blackboard uses a Blackboard building block, or plug-in. When the building block is installed, it allows access to all Turnitin services (OriginalityCheck, GradeMark and PeerMark) without users having to leave the Blackboard environment or log into the Turnitin web site directly. Turnitin services are displayed in their own browser frame, using the standard Turnitin user interface. The building block integration also provides added functionality such as access to view a list of all assignments and then access the Turnitin dashboard for grading, and accessing the Turnitin Assignment inbox via the grade center. When creating an assignment, an instructor

[8] SOAP - (Simple Object Access Protocol) is a messaging protocol that allows programs that run on disparate operating systems to communicate using hypertext (HTTP) and extensible markup language (XML)

[9] RESTful API – allows users to connect and interact with cloud services

can select a Turnitin Assignment from the Assessment menu and configure assignment parameters. It is a one-step process.

Turnitin functionality can be added to the LMS as an LTI (Learning Tools Interoperability) tool provider. All LMS's piloted are LTI compliant. Canvas and Brightspace can only allow for LTI integration. Blackboard Ultra can have both a plug-in for traditional course view and an LTI tool provider for use with the Ultra course experience.

With the LTI integration, the process for creating an assignment in the course requires a two-step process. First, instructors need to create an assignment, and then they need to access the assignment and click on the Settings to configure assignment parameters. When grading, instructors cannot access Turnitin Assignment inbox from the grade center, they would need to click on the Assignment to view the Assignment Inbox.

Currently, Turnitin is working to extend the capabilities of its LTI, in order to reach eventual feature parity.

Ongoing technical implications: Any changes to third-party tools may require configuration changes and testing prior to making updated tools available to LMS users. Blackboard building blocks, or plug-ins, can be easily installed by Cornell system administrators on the current system. Blackboard Ultra would require that the vendor install any plug-ins. In all three systems, any integration done via LTI would require minimal maintenance. Updates to custom applications, done via API, would be completed independently of the LMS.

Course Content and Student Data

Faculty need to be able to export course materials, including assessments, to save them off-line for re-use. They should also be able to copy or import their material into another course. Faculty and academic support staff should be able to access students' course work, including grades, and have the ability to remove all student course work to comply with the Retention of University Records policy 4.7. Most importantly, the ability to completely recover a course, including student work, must be provided.

One-time migration considerations: Instructors should be able to download course data for off-line storage and they should be able to upload material from content providers, from another course, or content from another system. In addition to course materials, instructors would also want to export student participation and grade records. All systems allow instructors to download content and student grades. Blackboard also allows instructors to create an archive package that includes both content and grades.

Canvas and Brightspace both support importing content. Brightspace has better import functionality for importing Blackboard specific course content and assessments. The Canvas tool for importing from Blackboard is not as helpful and requires a lot of time in restructuring content and recreating assessments. The Blackboard Ultra system would have all course content and student participation migrated, however, if the instructor chooses to switch to the Ultra course experience, not all content or activities would be converted. The instructor has an opportunity to test their course first before deciding if they want to switch to the Ultra experience.

Ongoing technical implications: All systems would allow instructors to re-use previous course content by importing it or copying from a previous course. Student submissions can be recovered if necessary from a course backup[10].

Should course recovery be required, vendors would need to restore a course from their backups. Blackboard maintains a backup of courses for 90 days. Canvas and Brightspace retain courses data in perpetuity.

System Updates and Maintenance

The three systems we piloted all use a Software as a Service (SaaS) delivery model. The benefit of this is that the vendor maintains the entire infrastructure and can provide continuous improvement to the product without taking down the system for updates and maintenance.

Currently, Cornell contracts with Blackboard's managed hosting service where the vendor maintains the system infrastructure. This delivery model allows the customer to decide the version and timing of updates. Any updates or system maintenance requires scheduled downtime.

One-time migration considerations: All pilot systems used a Software as a Service (SaaS) delivery model. The benefit to this is that problems are addressed quickly and new functionality arrives more regularly. Typically, there is no system downtime for these system changes. This also implies that the functionality of any piloted systems may be different from the time it was piloted to the time Cornell may choose to migrate. In addition, it may be changing during the migration.

Ongoing technical implications: The Blackboard Ultra system using SaaS delivery, as well as Canvas and Brightspace would allow continuous system update where changes are pushed to the user as they become available with no down time.

The implications of this is that the updates are pushed by the vendor not at customer request and these changes may introduce changes to user experience or new functionality. Cornell's instructional support staff must invest time to continuously monitor Test systems for any changes, and keep user documentation and notifications up-to-date.

These changes may also impact integrations with the SIS system or 3rd party vendors. System administrators would need to verify changes and coordinate updates with vendors or custom web developers.

All vendors offer test (beta) and staging environments in addition to the production environments that are necessary to preview changes and to test any third-party configurations.

[10] A backup is a complete course recovery to a specific point in time. It should contain all data from the point chosen.

System Audit and Support

It is important for the institution to know how the system is used. Cornell system administrators should be able to have access to user usage and log data for audit and discovery purposes.

One-time migration considerations: Blackboard provides access to the system database and all system logs. An administrator with the open database access can get user activity data across courses and system usage data. Access for many administrative and audit tasks in Canvas requires a greater level of technical knowledge for day-to-day administrative support. For Brightspace, most administrative tasks must be deferred to the vendor.

Ongoing technical implications: Work would be required on as needed basis. There are no implications for any specific system.

Customizing Cornell experience

The LMS should reflect the institution's brand. Users should be presented with a Cornell themed login page, which can include institution-specific content. For example, the start of semester workshop information, how to contact local support, etc. A Blackboard custom login page is developed and maintained by Cornell admins. On the login page, users see the Cornell NetID login, Weill user login, and Guest user login options. It also includes security information and has links to Cornell resources. This page is uploaded to the Blackboard managed hosting cloud service.

In addition, organizational content can be made available to specific audience. Currently, Blackboard allows system administrators to create custom content for specific audiences. This is done by creating pages (tabs) and modules within pages. For example, we have a Help for Instructors page (tab) that contains links to resources and documentation on grading, requesting courses, and tracking student progress. There is a tab for the Cornell University Library that allows librarians to update information regarding their services for students and faculty. These modules can have permissions set to allow them to be seen by subsets of users in the Blackboard system. For example, a Policies and Guidelines module is available to faculty and staff only so that they have readily available information regarding policies such as copyright and links to report student academic concerns.

One-time migration considerations:

As with Blackboard, Canvas can have a custom login page however, it would require hosting the login page with a different provider such as Amazon Web Services (AWS).

Brightspace allows customizing the look and feel of the login page and organization homepage. The home page can include a logo, images, widgets, including custom widgets. This would be similar to the current use of custom pages and modules we use in Blackboard.

Brightspace supports the use of custom widgets. Widgets allow you to expand the functionality of available content on organization homepages or on course homepages. Users can add custom HTML code to create a wide range of widgets.

This level of customization is not possible with the Canvas or Blackboard Ultra. We would need to explore other methods for providing such information to users.

Ongoing technical implications: Once the organization login page is created, it should not require maintenance unless authentication requirements change.

With Blackboard or Brightspace, custom content may need to be maintained and updated. Both systems have a simple web interface that allows updating text as needed. Canvas does not offer this customized functionality.

In the future, if Cornell wishes to design and deploy templates for courses (on the College or department level) there are options to do so:

- With Blackboard, a template course can be created and then copied into each new course that is created using SIS integration framework. Blackboard also allows some default course navigation settings to be pre-determined when a course is created. The new Blackboard Ultra does not allow this customization. With Blackboard Ultra, all courses would have the same base structure.
- Canvas has introduced “Blueprint Courses” which would act as templates. These courses allow course administrators to create content and learning objects, lock specific settings or content items, and push updates to all associated courses through course synchronizing.
- Brightspace has a process for accomplishing this but is less straightforward. Course templates cannot be easily accessed from the course selector or My Courses widget.

10.3. Conclusion for the Technical Analysis

A change to a different system would require remapping existing business practices. In some cases, new supporting applications and processes would need to be put in place in order to meet functional requirements.

Blackboard Ultra would require fewer changes and therefore less effort. Most configurations would carry over from the current environment.

Brightspace is a more complicated system to maintain. However, the vendor would be providing most back-end services. The benefit of this is that we do not need to build in-house expertise. The downside is that this option offers less flexibility for Cornell and slower response rates to changes since we would have to rely on the vendor’s schedule.

A Canvas system would require skilled support to maintain custom API’s. Otherwise, the system is very straightforward to configure should we choose to accept its out-of-the box functionality.

11. Accessibility Review

Summary: All three of the systems are ADA and Section 508 Compliant. Blackboard has a unique feature called Ally, a tool that can integrate with any LMS to automatically review content and provide alternative accessible options to users. In their responses, Desire2Learn repeatedly provides evidence of their commitment to providing an accessible system to all. Including usability testing internally and externally, proactively engaging with users who have disabilities, and presenting at some of the largest accessibility conferences. Canvas also attends conferences, and thinks of accessibility as one of its four “non-negotiable” elements that each of their products and services needs to have.

Our goal in performing an accessibility review was to identify the methods used by each LMS vendor to ensure that their product is accessible to all. To achieve this goal we worked with the Student Disability Services office. They provided a series of questions, each carefully constructed to provide details on the measurements taken by each vendor to make their product accessible.

Those questions were:

Process

1. Describe your accessibility conformance testing process.
2. Describe measures you have taken to ensure your IT products or services are accessible.
3. Is there an open issue queue of known accessibility issues for the IT product?
4. If there are known barriers for users, vendors should be asked to make a commitment to improving accessibility over a specified timeline.
5. Has your team ever worked with Accessibility as a functional requirement?
6. What are your company's internal standards for developing with accessibility in mind?
7. Does your company have a roadmap for accessibility going forward? If so, can you give us a general outline (goals/milestones)?
8. Have you tested and/or developed your mobile apps (especially iOS) with accessibility in mind?
9. What automated tools do developers & designers use to evaluate their work?
10. Describe the steps you take for manual testing of your interface.
11. How are you keeping pace with the changes in Assistive Technology?

Experience

1. Do you have clients who require web accessibility? If so, in outline, how are they ensuring your product meets their requirement?
2. Do you do testing with users with disabilities? If so, can you explain the process and identify, roughly, the range of disabilities and access technologies used?
3. What experience do developers on your team have coding for accessibility?
4. Have your developers contributed to any open-source accessibility work you could link to?
5. How do your developers and designers stay up-to-date with best practices with web accessibility?
6. What resources do you refer to for information about addressing accessibility?

7. Have you adopted a Policy-driven Adoption for Accessibility (PDAA) framework to demonstrate the extent to which your organization has implemented accessibility best practices?

In the summer of 2017, we sent the list of questions to Blackboard, Brightspace, and Canvas and requested they respond to each.

Highlights from each vendor's responses are:

Blackboard

References the WCAG 2.0 AA guidelines as a measure of their accessibility, which is a standard in the industry. When asked how they keep up to date with new assistive technologies, their only reference was to staying current with Jaws software. Multiple assistive technologies should be considered, along with technologies that are not as current (users may not update to the latest product). Unique to Blackboard is its Ally service, which integrates with the LMS and automatically runs all course content through an accessibility checklist. The service also generates accessible alternatives to the faculty member's original content. Ally can also be integrated into other learning management systems.

Brightspace by D2L.

Consistently throughout their responses, Brightspace showed their dedication to ensuring that their product can be used by all. D2L tests their product internally and externally using accessibility groups and treats accessibility issues as high priority defects. Additionally, Brightspace's commitment to accessibility by thinking beyond visual accessibility and by considering users with mobility disabilities. They proactively engage with users who are disabled, which helps keep them on up to date on new products and technologies. Additionally, Brightspace sends developers and engineers to some of the largest accessibility conferences. Overall, out of the three vendors, Brightspace appears to have the best grasp on the challenges that come with creating an accessible product and are most proactive in trying to overcome those challenges.

Canvas by Instructure.

Accessibility is one of Canvas's "four non-negotiable elements" of all their products and requires each of its developers, engineers, and QAs to go through an accessibility course. After, engineers are required to solve an accessibility issue. Employees are kept up to date and aware of accessibility issues via Lunch & Learn presentations, mentoring, code reviews, and additional training. Canvas does not do product testing directly with users who have disabilities. However, the Canvas community has a dedicated user group that focuses on providing feedback and voicing concerns with the product. Additionally, their internal accessibility group attends and occasionally co-presents at conferences.

Their full responses can be found in Appendices P, Q, and R.

12. Security and Policy Compliance Analysis

System Security

Cornell's Information Technology Security Office (ITSO) conducted a Technology Risk Assessment for each of the three candidates. The full reports of those assessments as available as appendices to this report (see Appendices S, T, and U). The principal distinguishing finding of the three assessments was a concern that Canvas's current user permissions model does not offer enough granularity to meet Cornell's policy requirements. Specifically, the requirement that undergraduate teaching assistants (TA) should not be given permission to view overall student grades within the course they TA. Increased granularity of user permissions is on Canvas's current development roadmap, and is expected to be available by the end of 2018. If Cornell chooses to implement Canvas campus-wide, the earliest that a campus-wide implementation could be available is January 2019, so this concern would be addressed by that time.

Procurement Issues

All three vendors under consideration have already done business with Cornell as part of this evaluation and are already registered as university vendors.

Data Retention

All three systems under consideration will give Cornell the ability to manage retention of student data in accordance with university policy.

Privacy and Regulatory Issues

While the university counsel would still need to review any contract Cornell decides to pursue, the standard terms and conditions of each vendor have already met the requirements of the Internet2 consortium of which Cornell is a member, so no significant problems are expected with respect to contractual issues related to FERPA or any other regulatory considerations.

13. Cost Analysis

[A thorough analysis of the cost analysis was performed. This information was provided to the University Leadership as requested. However, to respect the privacy of our vendors, specific costs have been redacted.]

Licensing fees vary between Blackboard, Canvas, and Brightspace. However, ongoing pricing for all three products is the same order of magnitude and the major consideration in any cost analysis becomes the one-time costs that would be associated with migrating the Cornell campus from the current system to a new one.

Option 1: Renew Blackboard License with a Minimum 3-year Commitment

If Cornell chooses to renew its Blackboard license, it is reasonable to expect that within two years Cornell's Blackboard instance would move between Blackboard's service offerings to a new service that would give Cornell instructors the option of using either an improved version of the "classic" Blackboard environment or the new Ultra environment on a course-by-course basis. While such a move would involve allocating Cornell staff time to support the move, no additional costs to Cornell are anticipated. Beyond the annual licensing fee, there would be no one-time cash outlay required from Cornell. If Cornell chooses to renew with Blackboard on a year-to-year basis rather than locking in a three-year commitment, the annual licensing cost is approximately 8% higher.

Option 2: Switch to *Either* Canvas *or* Brightspace with a Minimum 5-year Commitment

If Cornell chooses to switch to either Canvas or Brightspace, the one-time migration costs are largely the same. Implementation of a new system would require significant effort involved in:

1. Creating new system integrations with instructional tools that the LMS interacts with
2. Restructuring the integration between the LMS and the PeopleSoft student enrollment system
3. Helping faculty convert existing course materials to the new system
4. Redesigning the custom self-service provisioning applications and new-course notification application that Cornell needs to support the campus requirements
5. Training faculty and staff on the new system
6. Coordinating migration to the new system
7. Supporting the operation and use of two different systems in parallel
8. Adjusting existing user documentation to support the new system
9. Integrating the new system with campus e-mail (principally to make sure email notifications from the new system don't run afoul of spam filters)

Given Cornell's academic calendar and the number of courses currently relying on Blackboard, migration to a new system is expected to take 1.5 years (July 2018 – December 2019). Under such a scenario, Cornell would extend its current arrangement with Blackboard on a year-to-year basis and would continue to use Blackboard during the transition period, migrating more courses away to new system for each academic term, with the new system first being used for the term starting in January 2019. By January 2020, all courses would be using the new system. The most

significant cost of migration is the cost of licensing two systems simultaneously. Note that the annual cost of going year-to-year on Blackboard is higher than the annual cost of a renewed multi-year commitment to Blackboard.

Though licensing two systems simultaneously accounts for a majority of transition costs, there are other significant costs both in terms of cash outlay and in terms of Cornell staff whose time would need to be reallocated to support the project. Implementation of a new application environment and creation of new system integrations would require skill levels in software development, technical analysis, and coordination different than what is required needed to operate, support, and maintain the system. This would require the involvement of additional staff during the transition period.

Additional Cost Considerations in Switching to Canvas or Brightspace

In addition, both Canvas and Brightspace offer ePortfolio services as part of the quoted service bundles. Evaluation of ePortfolio services was outside the charge of this evaluation, but in the event that Cornell chooses to switch applications, it should investigate the ePortfolio offering to see if it is a viable alternative to Cornell's current ePortfolio service. (The existing Blackboard ePortfolio service included in Cornell's current LMS is not considered a viable alternative.)

Canvas and Brightspace both charge based on a per-user fee, where the number of users at an institution is based on the number of students registered as reported by the U.S. Department of Education. The per-user price goes down at certain thresholds based on the total number of users. Cornell is currently reported at just over 22,000 users. Cornell Weill Medicine already uses Canvas and has ~1,100 users. The combined total reported number of users for Cornell and Cornell Weill Medicine is 23,504. *Note that the Canvas price quote in the figure above is based on this overall total.* This figure has not yet been updated to include students enrolled in the New York Cornell Tech campus. The ILR School at Cornell also uses Canvas for Executive education. There is a pricing threshold for Canvas at 24,000 users that reduces the per-user price by 4%. If Cornell consolidates contracts and is able to qualify for the 24,000+ user pricing tier, the overall price that Cornell pays for Canvas would be reduced. (Cornell Weill Medicine's much smaller number of users imply that it is already paying a much higher per-user fee.) While this savings is still insignificant compared to the one-time cost of migrating the Ithaca campus away from Blackboard, in the event that Cornell decides to migrate to Canvas this opportunity should be pursued.

There are other considerations that impact cost. If Cornell chooses to migrate to Canvas, Cornell's existing use of SCORM modules for some courses would require a subscription to a 3rd-party service, which integrates with Canvas. This would cost $5,000 per year. This is a very minor factor to consider. If Cornell chooses to migrate to Brightspace, Cornell may wish to purchase additional licensing for Desire2Learn's advanced quizzing tool for a small annual fee. In addition, Cornell may attempt to negotiate with Blackboard to reduce the cost of licensing in FY 20 since the full license would only be required for have the year. This is not a standard option.

Cost Analysis Conclusion

The cost of changing to a new LMS is more significant than any cost differences between the contenders. If Cornell decides to switch systems, such a decision will need to be based on the value of the intangible assets and/or goodwill that such a move might create based on the data provided in the rest of this report. For example, such intangible assets might include a reinvigorated enthusiasm for innovation in teaching, positioning for future teaching trends, or a more positive student learning experience spurred by a new user interface. Such considerations are a matter of judgement for academic leadership to consider. Cost savings cannot be a significant driver or rationale for changing to a new LMS.

Conclusion

Cornell Academic Learning Management System
Evaluation Project

14. Conclusion

Combining all of the above analyses, we offer the following conclusions.

Clearly, all three LMS offer a broad range of the similar tools and functionality. Unsurprisingly, there is no single LMS that is superior across the board in meeting Cornell's current teaching and learning needs. Considering the future of higher education, and what the next generation learning management system will look like, adds to the complexity.

Currently, faculty members are mildly content with Blackboard. It generally meets their needs, and a little over half of the faculty who took the survey would like to continue using it. Yet, when asked if Cornell should adopt a new LMS, almost half had no opinion. From interviews and survey comments, we learned that some faculty have no opinion because they do not know what else is out there and although faculty are comfortable with Blackboard they are also open to something new if it is an improvement.

Students are for the most part satisfied with Blackboard. Surveys and roundtable discussions with undergraduates and graduate students reveal that like faculty, students are also open to trying out a new system if it is an improvement upon their experience. Two major themes from students are the desire to have a consistent user experience and mobile access.

Faculty also use the Learning Management System in quite varied ways. While the majority use it to share files with students, faculty teaching large classes depend heavily on the grade book, and smaller but increasing numbers of faculty use a wide range of features such as discussions, peer review, inline-grading, quizzes and tests. From surveys, interviews, and interactions with pilot faculty, it is clear faculty need a system that is flexible enough to meet their diverse needs. It must have a clean, intuitive interface, with a variety of tools and features available. However, faculty also want to feel like the additional features are optional, and not something they *have* to use.

The Cornell teaching community is not alone in their desire for a flexible system. Learning management systems are continuing to evolve, and increasingly lean in the direction of becoming a hub for third party integrations and course resources. This will require them to be flexible and rapidly adaptable. Moreover, the future of the LMS involves moving beyond course management functions to expand the use of evidence-based teaching methods and to engage faculty in making use of learning analytics to facilitate student learning. Supporting teaching innovation requires an LMS that is easy to use, facilitates learning, and is agile and adaptable.

With all this in mind, we offer an evaluation of the pros and cons of Cornell choosing each of the systems. Our thorough review of the respective systems yields the following conclusions:

Blackboard Learn

Note: If Cornell chooses to stay with Blackboard, it is expected that by 2020 Cornell will be using a Blackboard environment that supports both the traditional learn interface and the Ultra experience.

Pros:

- No transition costs and no need to initially operate two systems simultaneously.
- Robust set of tools – Blackboard scored very high on the requirements analysis.
- Faculty and student familiarity – most faculty and almost all students already use Blackboard.
- Meets expressed majority faculty satisfaction with Blackboard – 60.2% of users reported being either satisfied or very satisfied with Blackboard.
- Building block tool integration means a tighter integration between third-party tools and the LMS, leading to greater functionality.

Cons:

- The user experience is overdue for significant updating. Many faculty commented on the outdated design.
- The number of faculty not using an LMS will likely stay steady. In general, faculty are not excited about using Blackboard Learn.
- A significant percentage of faculty are unaware of the full set of tools available due to the challenges of navigating the interface – interviews revealed a persistent pattern of faculty asking for tools that already existed.
- During the pilot semester, we learned that the College of Veterinary Medicine might consider moving to Canvas if Cornell stays with Blackboard.
- Maintaining the status quo makes it more difficult to engage faculty in innovation.

Blackboard Ultra

Pros:

- Offers two versions in the same system, providing faculty with the flexibility of having the same functionality they have in Blackboard OR a far simpler, cleaner interface with less functionality. This could keep current robust users happy, and potentially (we could not test this in pilot) encourage more use by faculty who want an LMS to work primarily for content delivery and file management.
- An updated, cleaner, and easier to use interface.
- Continual updating. We would not need to wait to schedule upgrades and there would be no downtime.
- A transition would require less additional support resources, but faculty would still have to spend time converting their courses if they used the new streamlined Ultra interface.

Cons:

- Although in the same system (with the same login), students would likely need to navigate two different interfaces depending on their professors' choice of the traditional view or the Ultra interface. Students in the pilot pointed to this as an obstacle to their learning.

- There would be some change in functionality for third party tools, as Ultra supports LTI integrations instead of the deeper building-block integrations.

Brightspace

Pros:

- Clean, modern customizable interface.
- Brightspace is equipped with the tools to meet most of Cornell's faculty and student needs.
- Designed to integrate easily with third party teaching tools.
- Transition to any new system provides an opportunity for faculty to consider integrating new teaching tools and pedagogies into their courses.
- Possibility of increasing the number of users across Cornell (though pilot experiences indicate this is less likely with Brightspace than another LMS).
- Migrating courses from Blackboard to Brightspace is cleaner than the other options.
- Significant cost savings compared to the other LMS options.
- Continual updating. We would not need to wait to schedule upgrades and there would be no downtime.

Cons:

- Transitioning to a new LMS will require additional faculty time and additional support resources.
- Pilot faculty preferred to stay with Blackboard rather than switch to Brightspace, citing that Brightspace was not an improvement over Blackboard.
- Faculty struggled to utilize the gradebook functionality (Brightspace expects to update the gradebook experience by 2019).
- There would be some change in functionality for third party tools, as Ultra supports LTI integrations instead of the deeper building-block integrations.

Canvas

Pros:

- Six out of ten pilot faculty preferred using Canvas to Blackboard.
- Canvas would work well, likely better, for most faculty needs.
- Clean, modern interface. Most pilot faculty found Canvas to relatively easy to use.
- Transition to any new system provides an opportunity for faculty to consider integrating new teaching tools and pedagogies into their courses.
- Designed to integrate easily with third-party teaching tools.
- eCornell's extensive library of Cornell-developed teaching resources exists in Canvas.
- Allows possibility to provide one LMS for all of Cornell (Weill Medical College and ILR Executive Education program use Canvas already).
- Continual updating. We would not need to wait to schedule upgrades and there would be no downtime.

- Canvas is open source and customizable. Widespread usage of Canvas among our peers increases possibilities for developing customizable teaching tools.

Cons:

- Transitioning to a new LMS will require additional faculty time and additional support resources.
- Any customizations leveraging the Canvas API would incur development and implementation costs. Additional training would be required to maintain and support the use of such customizations.
- There would be some change in functionality for third party tools, as Canvas supports LTI integrations instead of the deeper building-block integrations.

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