Washington University in St. Louis

Feb. 16, 2018

LMS Evaluation Final Report*

The time is right to identify and implement an alternative Learning Management System (LMS) which will bring our system up to the level of our peers and aspirants and fully support the advancement of teaching and learning at Washington University in St. Louis. Our existing LMS, Blackboard Learn, is an outdated product, set to be replaced by the company in 2019. In addition to strong dissatisfaction with Blackboard reflected in faculty feedback, support staff members have found Blackboard's support to be less than responsive in addressing bugs and problems. Combined with a previous failed pilot of Blackboard's replacement product (Ultra), the institution has lost confidence in Blackboard.

A robust LMS is required to satisfy the high expectations of students and faculty. We do not believe Blackboard represents this industry-leading solution—especially in light of recent high-profile adoptions of Canvas including Harvard, Penn, Stanford, Yale, Brown University, Georgetown, and our own MD Program. Brown University noted seven reasons for switching to Canvas including ease of use, mobile friendliness, integration options, and accessibility. To determine if Washington University should adopt a similar path, the LMS Review Committee conducted a pilot evaluation to compare the features, functionality, design, and ease of use for two possible replacement systems: Canvas and Schoology.

This Final LMS Evaluation Report responds to the Teaching and Learning (T&L) Domain Committee charge to the LMS Review Sub-Domain Committee. The LMS Review Committee was charged on Sept. 22, 2017 as follows:

- Develop and implement strategy to gather instructor, student, admin., and stakeholder feedback and evaluate Canvas and Schoology as possible alternative Learning Management Systems to replace Blackboard.
- Implement fall 2017 pilot of Canvas and Schoology which includes representative cross-section of courses and class types representing all major schools within the university.
- Explore possible support structure models (people and services) required by a next-generation LMS. Provide feedback and insights to the LMS Support sub-committee, which will be charged with the development of specific recommendations and proposed LMS support model changes.
- Coordinate communication about LMS Review status and timeline with WUSTL campus community.
- Coordinate WUSTL community LMS outreach and focused demonstrations.

In the sections that follow, we detail the LMS Review Committee's work to satisfy this charge and to complete a fair, thorough, transparent, and detailed evaluation process to recommend Washington University's future LMS.

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* Report prepared by Emily Thompson and Jason Crandall, with significant contributions from Carolyn Dufault, Pat Matthews, Richard Abrams, and Teri Davis.

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Recommendations

Based on analyses performed by the LMS Review Committee, the Teaching and Learning Domain Committee recommends **Canvas** as the next generation LMS to replace Blackboard as a university-wide LMS. Washington University faculty, staff, and students in the Fall 2017 LMS Evaluation Program ("pilot") rated the Canvas LMS more positively than Schoology. And, while the pilot was not structured to provide a head-to-head comparison, Canvas was favored over Schoology in each measure where a statistically significant difference existed.

In addition, our recommendation is consistent with recent trends and pilot program outcomes at other campuses. As of Sept. 2017, edutechnica reported that, while Blackboard still leads with "just under one-third" of LMS market share, institutions have recently been adopting Canvas at an accelerated pace. In fact, "Instructure [the maker of Canvas] has more than doubled its market share position, both by number of institutions and enrollments, over its next nearest commercial competitor, D2L."

1. An Industry-Leading University-Wide LMS

IT leadership has expressed concern about the recent proliferation of Learning Management Systems across campus. Given the shortcomings of Blackboard, this trend is expected to continue unless we move to an industry-leading, next generation LMS with strong stakeholder buy-in across the institution. In addition to the increased cost of licensing multiple systems, the lack of a central LMS with strong stakeholder buy-in results in a degradation of service quality and increased cost, as limited staff resources are spread across multiple systems. Multiple systems also add unnecessary complexity and overhead to the teaching and learning experience, particularly for students in interdisciplinary degrees and programs.

Of course, the cost of acquisition and annual maintenance must also be weighed for any proposed LMS solution. While a cost comparison between systems was not within the scope of our charge, the proposed Canvas contract would put base licensing costs on par with what the university currently pays for Blackboard Learn. The full contract will be presented to and considered by IT governance committees prior to a final determination.

2. The Need for LMS Governance and Support

The T&L Domain Committee acknowledges leadership concerns regarding the fractured and incomplete nature of institutional support for our current LMS. Choosing a new tool presents the university with an opportunity for improvement in this area. A separate sub-domain committee, jointly led by WashU IT and the Teaching Center, has been tasked with producing support recommendations for a new LMS during the spring of 2018.

Our recommendation, based on the pilot as well as feedback from other institutions, is to institute a standing LMS support and governance structure going forward. We also recommend outsourcing 24/7 LMS support service to the vendor as an affordable complement to institutional staffing. Additional staffing recommendations, such as the hiring of a dedicated system administrator and/or possible temporary staffing during the implementation phase, will be made by the LMS support sub-domain committee.

3. Required Third Party Integrations

Some faculty rely upon Blackboard's ability to integrate with third party services for additional integrated LMS functionality. Examples include lecture capture solutions like Mediasite, textbook integration solutions like Pearson MyLab or McGraw-Hill Connect, and Piazza for "Wiki-style" collaboration. Initial comparison work between Canvas and Schoology on third party integrations has been completed as part of the LMS Evaluation Program and will be shared with the implementation team. In general, as a more mature product, Canvas has more "native" third party integrations than Schoology.

We recommend that the implementation team review the initial "third party integrations" work completed during the Fall 2017 LMS Evaluation Program, consider all third-party integrations currently in use, review degree of support with the new LMS, select possible substitutes where needed or desirable, and solicit the input of stakeholders on campus. Two key decision points for third party integrations will be: (1) the replacement of Blackboard's built-in SafeAssign tool with an industry-leading anti-plagiarism tool (TurnItIn), and (2) possible licensing of an external web conferencing tool to replace Blackboard Collaborate. As technology evolves and new tools are created (many free for faculty use), a third party integration request, testing, and approval process will need to be included in on-going LMS governance.

4. Phased Adoption

Based on best practices for LMS migration in the higher education industry, we recommend a phased adoption approach for the next generation LMS. A possible timeline could be:

1. procurement of the new LMS in early Spring 2018,
2. implementation during Spring/Summer 2018,
3. Early Adopter Phase I where faculty may opt in to teach with the new LMS in Fall 2018,
4. Early Adopter Phase II for remaining faculty to opt into the new LMS in Spring 2019,
5. transition from Blackboard to the new LMS in Fall 2019.

Background Prior to LMS Review Committee Charge

In this section, we review the process leading up to the evaluation of an alternative LMS.

Fall 2014 Survey & IT Governance Committees

There have been efforts underway since 2014 to provide a centralized evaluation of the Blackboard Learning Management System, adopted university-wide in 2012 (The Source, Nov. 3, 2011). In the fall of 2014, a faculty survey of Blackboard use and perceptions was conducted jointly by The Teaching Center, University Libraries, and WashU IT. Mixed support for Blackboard was found among respondents, and the survey results highlighted key areas of concern which persist to this day. Concerns include feedback from faculty who say Blackboard is not particularly user-friendly and perceptions that there are insufficient resources available relative to the need for technical and pedagogical support required for full and effective use of the system. A summary of results from the Fall 2014 survey are available at lms-evaluation.wustl.edu under 2014 LMS Evaluation.

In the same semester, the Office of the CIO charged a series of IT governance committees representing several broad domains at Washington University (see cio.wustl.edu/governance/governance-committees). One of these

new committees was the IT Governance Teaching and Learning Domain Committee—charged to focus specifically on information technology in teaching and learning and first chaired by Associate Provost and Associate Vice Chancellor, Dedric Carter. Under Vice Chancellor Carter's leadership, the T&L Domain Committee identified the review of Blackboard and consideration for a possible replacement LMS as an ongoing priority topic for the committee. Throughout academic year 2014–2015, the T&L Domain Committee discussed the need for an LMS review process at almost every meeting. In the summer of 2015, a proposal was made in the T&L Domain Committee to conduct a formal LMS evaluation pilot comparing at least three new systems as possible replacement options to Blackboard. The three systems were: 1) Blackboard Ultra, a next-generation version of Blackboard and the company's planned successor to our current version of Blackboard Learn; 2) Schoology, a new, alumni-developed LMS which had found early success as an LMS in the K-12 educational space; and 3) Canvas, a newer and rapidly growing LMS, which had just been selected as the new LMS by the MD Program in the School of Medicine.

2015–2016 MD Program Adoption of Canvas & Informal Pilot of Schoology

The MD Program piloted Canvas as a replacement for a homegrown LMS based on an aging Lotus Notes platform during the spring of 2015. While Lotus Notes allowed for a high level of customization to MD Program-specific needs, there were ongoing issues with user-friendliness, accessibility, and the absence of features associated with modern Learning Management Systems—including messaging, assessment tools, and gradebooks. During the Lotus Notes era, several MD Program faculty developed and used their own personal systems to support teaching and learning in their individual courses. This led to a fracturing of the student experience and created challenges with central oversight of the full MD curriculum. Following a successful pilot in the spring of 2015 with four MD courses, the MD Program selected Canvas as its new LMS. Required courses were transitioned to the new system in 2015–2016. Aside from a few hiccups, the rollout and implementation of Canvas for the MD Program has been well-received by students, faculty, and administrators based on feedback gathered through planned surveys and feedback sessions with the education leadership team.

On the Danforth campus, in the fall of 2015, a small group of faculty members in Engineering, Business, and Arts & Sciences began using Schoology for their courses as part of an early, informal exploration of the platform. In February 2016, Ron Cytron, Professor of Computer Science in the School of Engineering, became the new chair of the T&L Domain Committee. At the February 15, 2016 meeting, the minutes reflect that the T&L Domain Committee arrived at the following two decisions:

1. The committee decided **not** to begin a request for information (RFI) process in 2016 to replace the LMS.
2. The committee agreed to continue exploring options in the LMS marketplace by piloting Canvas, Schoology, and Blackboard Ultra in the Summer and Fall 2016 terms. The committee indicated a desire to pilot at least five courses in each LMS and to invite faculty who had not yet adopted Blackboard to participate.

Due to an unplanned series of events, after the February 15 meeting, the T&L Domain Committee did not meet again during 2016. Throughout the remainder of the year however, members of the committee were aware that several courses across the university were using Canvas, Schoology, or Blackboard Ultra, particularly during the Fall 2016 semester as part of an informal "pre-pilot."

Valuable lessons were learned during this pre-pilot period. In the fall of 2016, the two courses using Blackboard Ultra were forced to discontinue use of the system mid-semester given critical failures that rendered the LMS unusable for students and faculty. On the other hand, the pre-pilot faculty who were teaching with Canvas and Schoology expressed enthusiasm and support for their Blackboard alternatives and communicated to the members of the committee that they hoped to see further consideration of these systems to replace Blackboard as the university's LMS.

Spring 2017: From Pre-Pilot to Formal Pilot

During the spring of 2017, Jennifer Stedelin, Deputy Chief Information Officer for WashU IT, served as the chair of the T&L Domain Committee. During this semester, several additional pre-pilot courses were conducted using Canvas and Schoology. These courses were again scattered across the university, and there was no central oversight of systemic feedback collected. During the spring of 2017, WashU IT organized a series of university-wide listening sessions to solicit feedback and ideas on the LMS review process from the broader community. Jennifer Stedelin told the T&L Domain Committee that the listening sessions were intended as a critical precursor to initiating a structured, formal and transparent LMS Review process.

In the summer of 2017, WashU IT submitted and approved a modest IT capital request to fund a formal pilot comparison of Canvas and Schoology during the Fall 2017 semester. Blackboard Ultra was not included in the formal pilot due to its performance failures during the pre-pilot period and due to Blackboard's unclear timeline to fix known issues. The current version of Blackboard Learn was also not included in the formal head-to-head comparison given the planned discontinuation of that version by Blackboard.

Following Jennifer Stedelin's departure from Washington University in the summer of 2017, Pat Matthews, Associate Dean of University College, and Carolyn Dufault, Assistant Dean for Education in the School of Medicine, were named as interim co-chairs of the T&L Domain Committee. The committee then named Jason Crandall, Director of Learning Design and Innovation in the School of Engineering, and Emily Thompson, Interim Director of Educational Technology at Olin Business School, as co-chairs of the LMS Review Sub-Domain Committee—charged by the T&L Domain Committee to develop and run the Fall 2017 LMS review pilot process reported below.

Listening Sessions & Faculty Survey

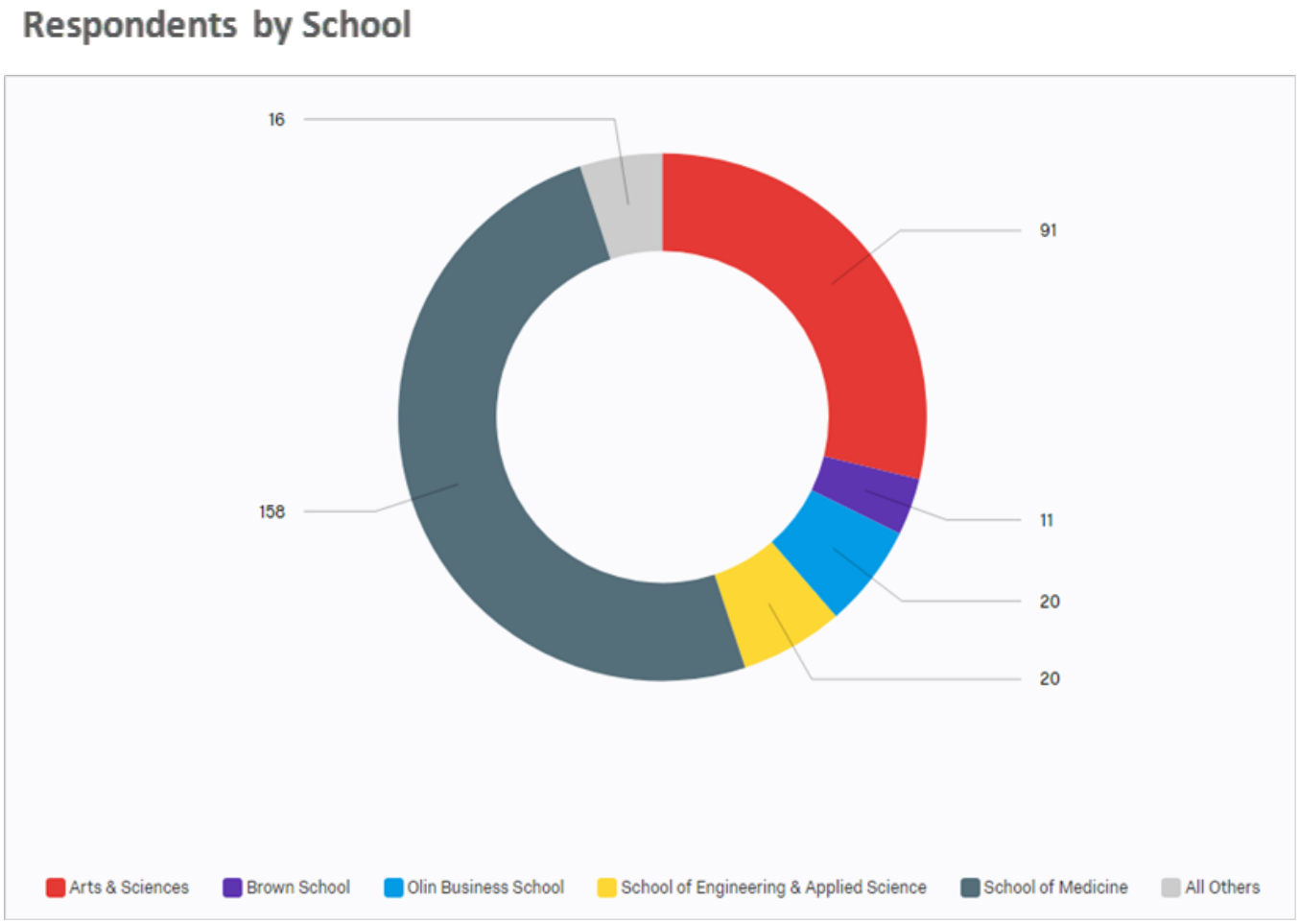
As noted above, in May of 2017, WashU IT conducted multiple focus groups or "listening sessions" across campus with 56 participants (faculty and staff LMS users). All faculty and staff were invited to attend. During these sessions, facilitators collected open-ended feedback via semi-structured interview questions. When asked how well the current LMS met their needs, 57% of participants reported that the system failed to meet even half of their needs. Only 9% reported that the LMS met all of their needs (regardless of perceived task difficulty).

As a follow-up to these listening sessions, an all-campus survey was designed and conducted by the T&L Domain Committee in late May and early June.

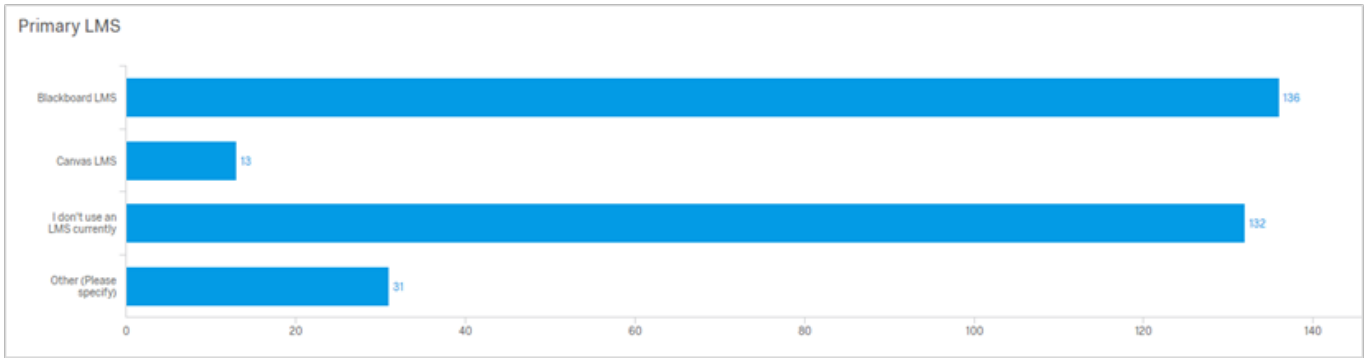
Results of that survey are presented below.

Review of May/June 2017 LMS Survey Results

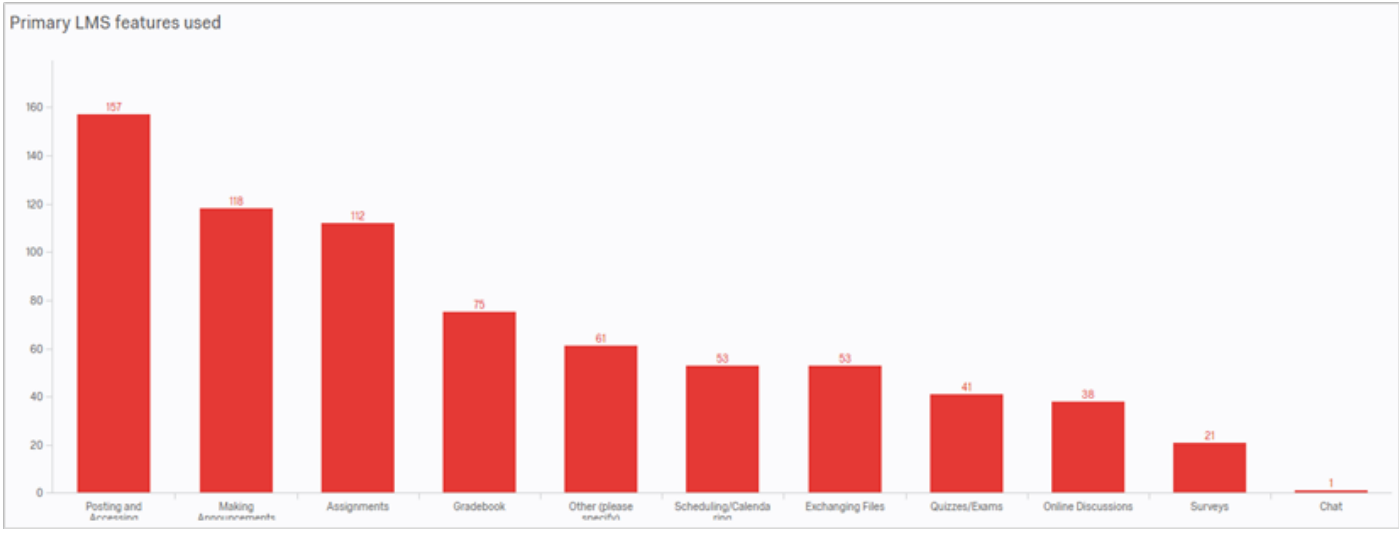
The LMS survey was available from May 23 until June 12, receiving over 1,700 responses. The analysis below focused on the reported experience of faculty (rather than staff)—the primary customers and users of an LMS within the university. Across the institution, 316 faculty members completed the survey, with the following self-identified school affiliations:



Among these faculty respondents, 43% used Blackboard as their primary LMS, followed by 42% who did not use an LMS. Only 13% used an LMS besides Blackboard (including Canvas, Learn@Work, and Schoology).



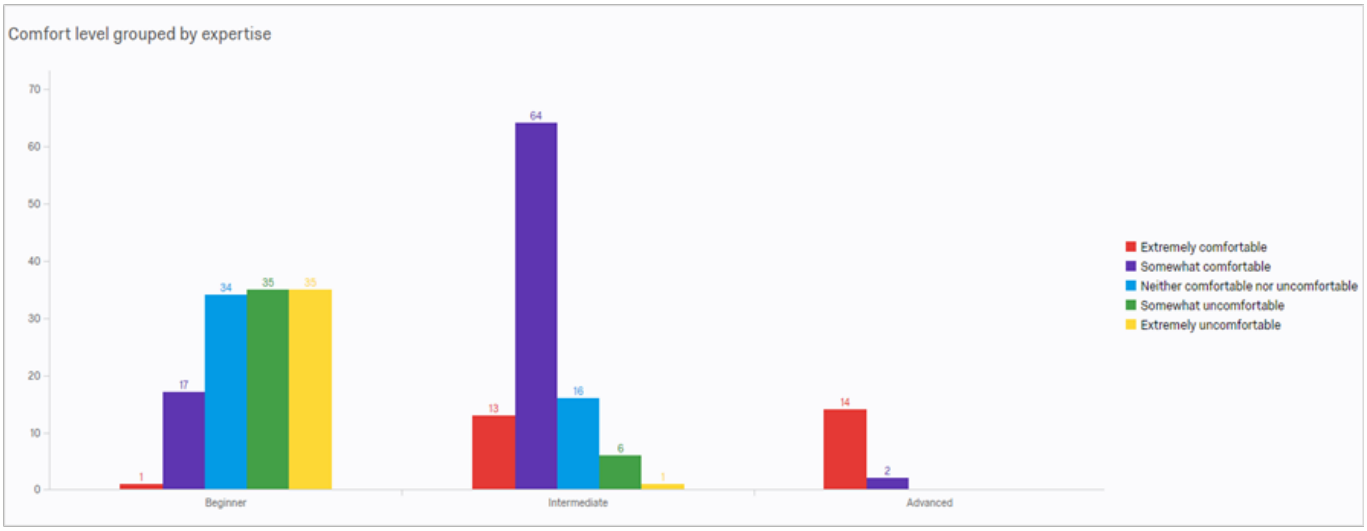
Asked about current uses of their LMS, 71% of respondents indicated that they use an LMS to "Post and Access Course Materials," followed by "Making Announcements" (53%) and "Assignments" (50%). It is notable that only 37% of respondents used the gradebook feature, despite the fact that external management and communication of grades stored outside of the LMS tends to be time-consuming.



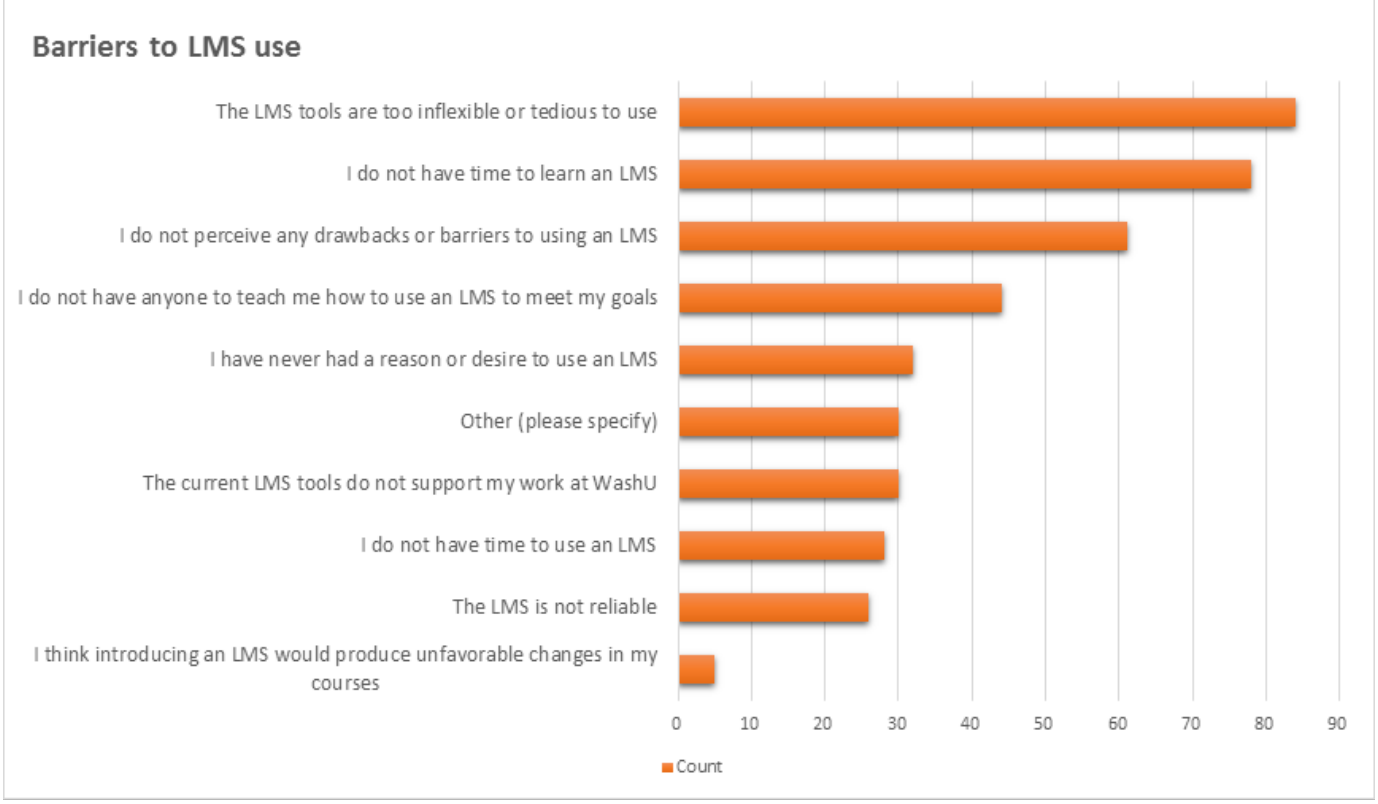
The majority of those who selected "Other" indicated that they did not use any features of the LMS. A few respondents expressed frustration here with attempting to make use of the current LMS:

- I find it so difficult to use that I leave this to the lab instructor and TAs - they can manage it.
- None. Blackboard is simply awful.
- Have no *@&#^$% clue. Usually give up with this.
- For grading I unfortunately have to use Blackboard

When asked about level of LMS expertise, 52% of faculty respondents classified themselves as "Beginners," 41% as "Intermediate," and 7% as "Advanced." Question 6 asked respondents to rate their comfort level with the main features of their LMS on a 5-point scale, with rating points from "5 – Extremely comfortable" to "1 – Extremely uncomfortable." The results are displayed below, grouped by expertise level. Thus, 33% of all users reported being “somewhat” or “extremely” uncomfortable using their LMS, while 34% described themselves as “somewhat” comfortable.



Participants were also asked about barriers to current LMS use (responses shown below in descending order):



While 28% of respondents indicated that they did not perceive any barriers, the remaining 72% selected at least one of the suggested barriers (on average, respondents chose 1.3 options). Of total responses that identified a barrier, 39.2% were barriers regarding the LMS itself (inflexibility, unsuitability, unreliability) while 42% identified lack of time or lack of support as a barrier. Since participants could chose multiple responses, it is likely that some respondents perceived both internal and external barriers to their use of an LMS.

We also collated and identified major themes within the open-ended feedback. Of the 300 faculty members, 85 opted to offer open-ended comments, and 56 of these mentioned Blackboard (the other comments pertained to

SharePoint or were requests to learn more about LMS in general). Only 9% of the comments about Blackboard were unreserved endorsements, and another 9% mentioned either Schoology or Canvas without any prompting (see Appendix A for questions posed in this survey). General themes are noted below in terms of count and percentage of responses:

	Number	Percentage
A. Blackboard is clunky, overly complicated/complex, difficult to use	**46**	**82%**
B. Blackboard seems fine	**5**	**9%**
C. Prefer Canvas or Schoology to Blackboard	**5**	**9%**
Other (complaints about SharePoint, general questions/curiosity about LMS)	**29**	**N/A**

Below please see representative comments from faculty:

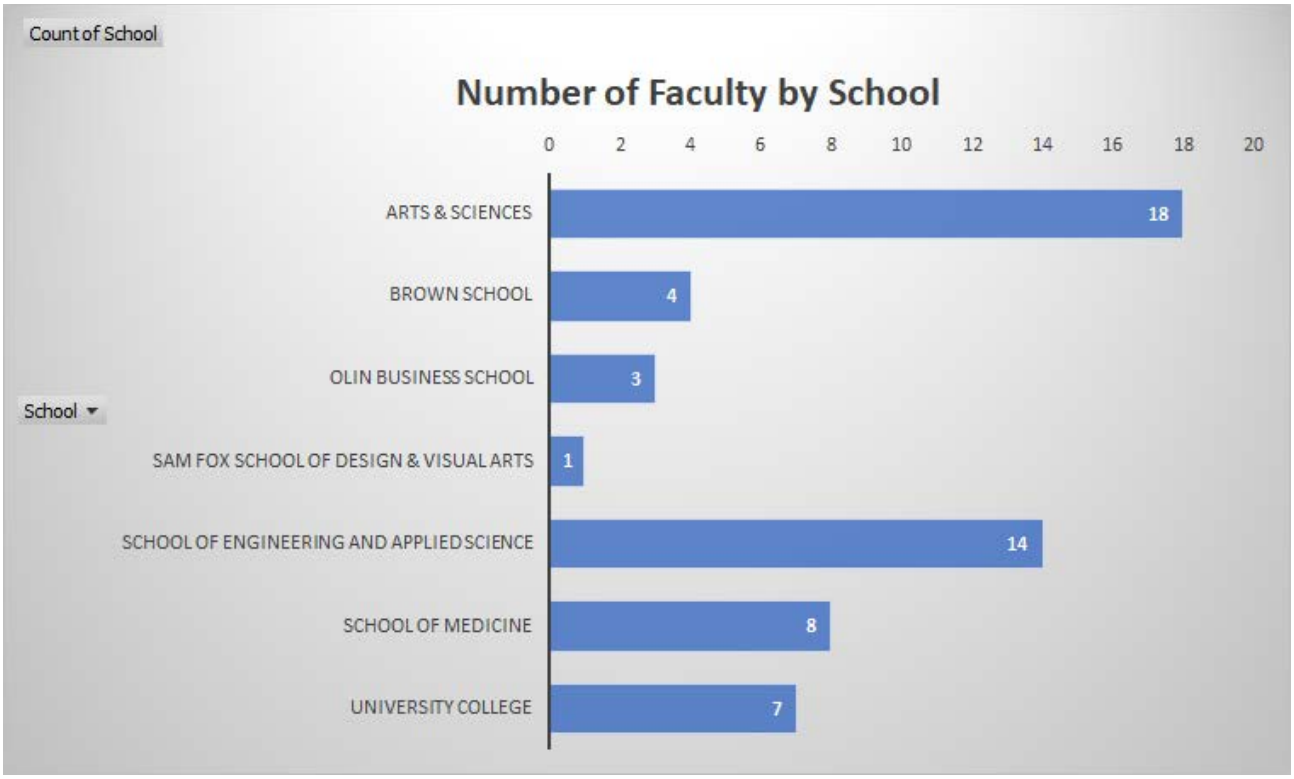
1. Blackboard is unwieldy, and I never could figure out what exactly my students were seeing. The grading system is a nightmare. I'm delighted that WU is seeking a new LMS.
2. I have experience with D2L, Canvas, and Blackboard. Of all 3, Canvas, in my opinion, was the most user-friendly, aesthetically pleasing, efficient LMS. In addition, it was highly compatible with iPad use, which I prefer.
3. Attended a blackboard training session and have tried to have TAs tutor me, but it's hopeless. I had just a managed to learn enough of Webfac or whatever it was called to handle communicating with students, managing the evaluation process, and grading, and now I have to start all over again. I teach approximately 100 students each AY. A disaster.
4. I would like to see something that looks a little less "internet circa 1994" than Blackboard. … Drop-down menus, over and over and over again, make me suicidal.
5. Blackboard resulted in my wasting vast amounts of time trying to find something that seemed moderately straightforward. Eventually, I decided not to use Blackboard any more.
6. I despise Blackboard because it is overly complicated. I have resorted to designing my own custom websites for my courses (using Pages), adding webforms for student input, and simply creating complex gradesheets at the conclusion of a semester.
7. I've tried to use Blackboard. It's awful: slow, tedious, stupid, hard to use. Flexibility doesn't mean having a lot of "features".

Summer 2017 LMS Evaluation Program Planning & Recruiting

Subsequent to the faculty survey, the T&L Domain Committee commissioned an LMS Review Sub-Domain Committee chaired by Jason Crandall and Emily Thompson. As noted elsewhere in this report, the LMS Review Committee was later formally charged with coordination, communication, instructor recruitment and training, and data collection and analysis for an evaluation of two LMS candidates—Canvas and Schoology.

The LMS Evaluation Program process began in July of 2017 as the committee identified instructors of record for all Fall 2017 courses, across all campuses. These 1,200 faculty were invited to apply for participation in the LMS Evaluation Program ("pilot") in Fall 2017. Applicants were asked to identify the course, anticipated enrollment, the types of instructional methods used, and preferred system (if any) between Canvas and Schoology. Faculty accepted into the pilot committed to teach at least one course within the assigned LMS, provide feedback about their experience via e-mail and a survey, and allow the committee to survey their students regarding their opinions of the LMS.

Over 60 faculty completed an application. Faculty who mistakenly responded to the survey but did not actually teach in Fall 2017 were rejected from the pool. All other applicants were accepted with approval from leadership within their relevant academic unit, including deans and directors who were asked for feedback on participating instructors or nominations for additional participants. Committee leadership sought participation from all academic schools on campus, but we were unable to secure participation from the School of Law (see figure below).



Efforts were made to accommodate instructors' preferred LMS for the evaluation, while at the same time balancing a roughly equivalent number of instructors (and students) for each system being evaluated. Every school had at least one faculty member testing each system, except for Sam Fox which had only one participating faculty and the School of Law which had none. Thus, a total of 55 faculty taught courses within the LMS Evaluation Program or "pilot" (roughly 29 in Canvas, 26 in Schoology). Likewise, there were 2,237 total student enrollments in pilot courses (1,119 in Canvas, 1,118 in Schoology) representing 1,941 unique students.

In at least one academic unit, two faculty members team taught one course within each system, with one taking a primary or secondary role in each system, so that they could each compare and contrast the two different systems. Two other faculty attempted to teach a different course in each system during the fall semester. One of the faculty dropped out of the Schoology evaluation early in the semester, while the other faculty member continued to teach in both systems for the duration.

During the semester, pilot faculty were invited to participate in on-campus training sessions with the vendor. Direct technical support and training was also available from the LMS Review Committee co-chairs. Formative feedback was sought via an informal survey during the middle of the semester. The bulk of the data from these participants was captured via the end-of-semester surveys, as reported below.

Fall 2017 LMS Program Evaluation & Results

During the fall semester, the LMS Review Sub-Domain Committee met regularly to discuss pilot progress, evaluation instruments, etc. As a result of these meetings, the committee decided to focus on three primary data sources for the evaluation while communicating the rationale, progress, and results of the pilot to the broader Washington University community.

Communication to the Campus Community

To engage with the campus community and increase awareness about the LMS Evaluation Program, the LMS Review Committee coordinated 14 vendor demonstration sessions advertised to the entire campus (more than 30,000 faculty, staff, students, and other WashU affiliates). These sessions were intended to allow for the broadest possible feedback from the community, rather than just awareness. In addition to faculty who were in our pilot program, advisers, administrative staff, deans and even alumni were given the opportunity to see the systems, ask questions, and alleviate concerns. Interested participants were allowed to try out systems in a sandbox environment. These sessions were also publicized in ***The Source*** (Evaluating a next-gen learning management system: Demonstrations of Canvas, Schoology to take place on both campuses, Oct. 18, 2017) and discussed after the fact on the CIO's website (Teaching & Learning Domain Committee Hosts LMS Demonstrations, Nov. 20, 2017).

Survey feedback from these sessions was collected and analyzed, but no significant difference between the two alternative systems was found (responses were favorable to both systems). Full data from these demos are available by request.

In addition to these open demonstration sessions, the Teaching Center convened two additional sessions focused on the specific needs of teachers for large, introductory courses[†]. These needs include the ability to merge multiple sections of a course but maintain student enrollment in sections within the merged course. The merging of such courses presents unique and complex challenges related to student enrollment, grading, and course administration. For this reason, and because these courses enroll the majority of our first- and second-year students who are transitioning into rigorous curricula across the schools, we recommend that the transition to a new LMS includes careful attention to these courses.

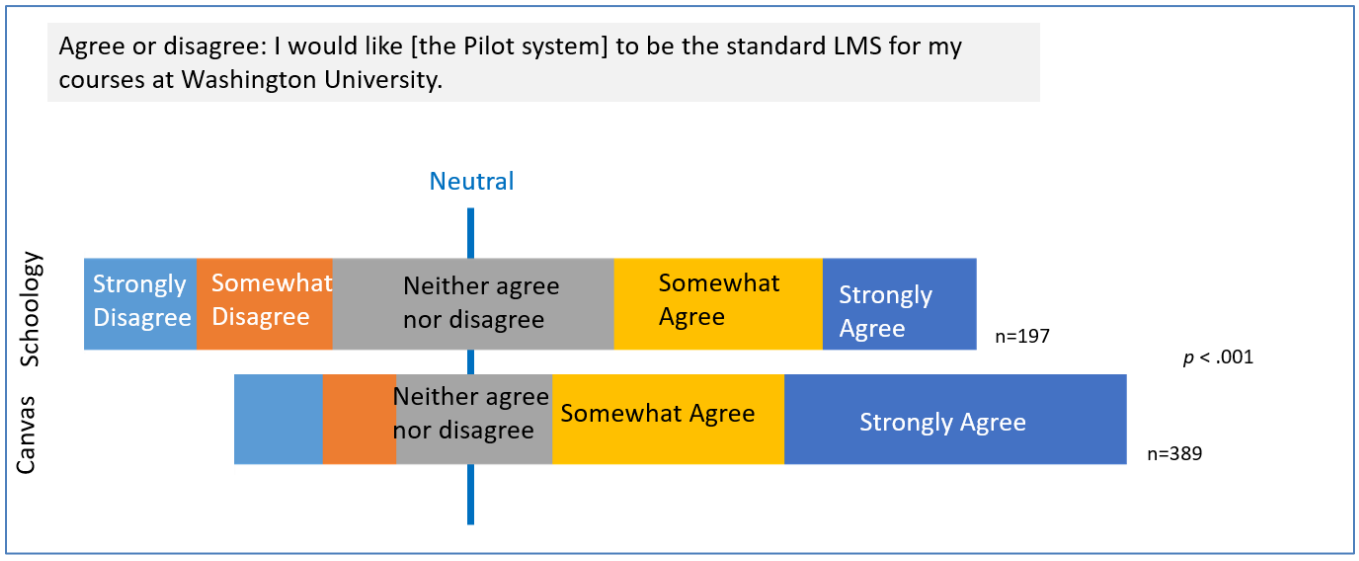
Results from Primary Data Sources

Our recommendation of Canvas is based on clear evidence from three primary data sources:

A) Faculty and Student Surveys (in-depth surveys of about 50 faculty and 600+ student pilot participants),
B) Use Case Testing, and
C) a Power User Focus Group (a focus group with faculty and staff who used both systems).

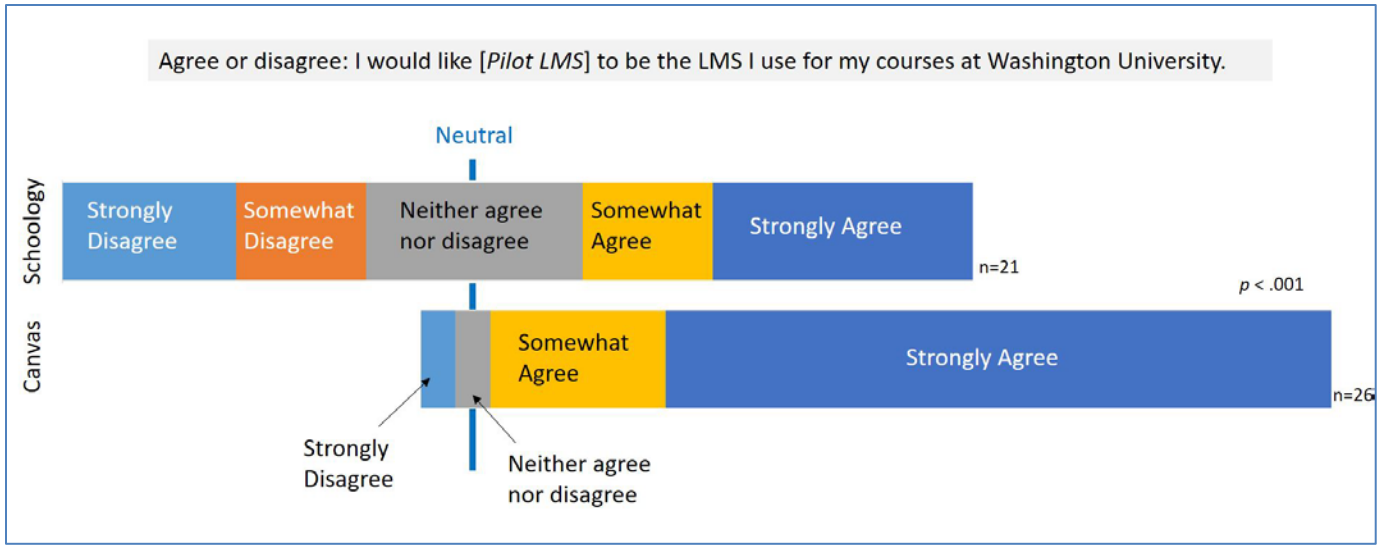
A. Faculty and Student Surveys

As shown in the figures below, both students and faculty were significantly more likely to agree that they would like Canvas to be the standard LMS for Washington University than Schoology. The preference was particularly clear among faculty users, with 24 out of 26 respondents (92%) favorably inclined toward the proposed selection of Canvas as compared to only 9 out of 21 Schoology faculty (43%) who expressed similar opinions toward Schoology.



Student responses to survey question regarding LMS preference.

[†] Due to the complexity of reconfiguring such high impact courses in an abbreviated timeframe, none of the faculty teaching these courses accepted the invitation to participate in the pilots of Canvas or Schoology.



Faculty responses to survey question regarding LMS preference.

Faculty were also asked to evaluate the "helpfulness" of each system in performing particular activities, such as "providing feedback on homework and assignments" and "tracking student progress in the course." Below are summary results of these scores, with the higher rated system highlighted in yellow.

Canvas was rated higher in eight of the nine activities surveyed, with an overall average "helpfulness" rating of 2.8/3, compared to an overall average of 2.67/3 for Schoology.

[1 = Not at all helpful, 3 = Very helpful]	Provide student feedback	Announce course updates and changes	Compute and share course grades with students	Share course materials and activities	Collaborate with TAs and other instructors	Help students prepare for tests or quizzes	Track student progress	Organize course materials and activities	Answer student questions
Schoology (n = 21)	2.54	2.63	2.60	2.90	2.67	2.64	2.85	2.85	2.50
Canvas (n = 22)	2.73	2.80	2.67	2.95	3.00	2.67	2.80	2.90	2.67

Another survey item asked pilot faculty to assess the ease of use for several features within the pilot system they used. These features included the Assignments tool, the Calendar, File storage, and the Messaging tools. Below are the average ease of use scores for each feature, where 5 = "Extremely easy to use" and 1 = "Extremely difficult to use." The number of responses vary per item below, as each faculty chose which tools to use independently.

	Activity feed	Updates	Assignments	Calendar	Discussions	Files	Inbox/ Messages	Modules/ Folders	Syllabus	Tests/ Quizzes
Schoology	4.75 (n = 9)	4.42 (n = 20)	4.53 (n = 20)	3.90 (n = 11)	4.56 (n = 10)	4.68 (n = 20)	3.71 (n = 15)	4.67 (n = 19)	4.45 (n = 11)	4.00 (n = 5)
Canvas	4.64 (n = 11)	4.61 (n = 18)	4.67 (n = 20)	4.57 (n = 14)	4.91 (n = 11)	4.68 (n = 22)	4.13 (n = 15)	4.73 (n = 15)	4.57 (n = 21)	4.75 (n = 12)

The results were similar for other items on the survey, as ease of use and effectiveness ratings from Canvas users were higher than those from Schoology users, and Canvas users were more likely to prefer it to Blackboard than were Schoology users. Although the study was not designed to facilitate head-to-head comparisons between the two systems, the relative ratings for each system over Blackboard favored Canvas. A complete statistical analysis of faculty responses can be found in Appendix C, and an analysis of student responses can be found in Appendix E.

Faculty Open-Ended Survey Feedback (Canvas)

We also collected open-ended feedback from faculty in the pilot. Below please see representative comments regarding pilot faculty's opinion of **Canvas**:

1. I very much enjoyed using Canvas this semester. I am really sad to have to go back to Blackboard … I have become addicted to the speed grader in Canvas. I rarely have to exchange paper with my students and I can give them better feedback which is more legible.
2. I'm teaching a fully online course in Canvas and I like it a lot. I could see using Canvas for all of UC's online courses, but not Schoology. I'd like Schoology to go away
3. I mainly use Canvas/Blackboard for posting lecture slides/study guides, notifying students of quiz dates, posting assignments and accepting (web url) submissions, and managing grades. I found Canvas to be way easier to use than BB, especially for assignments which were way more flexible. Rubrics were much smoother and more flexible in Canvas, and the "web url" assignment submission was perfect for my use case, and much easier for students to use than BB. I also really liked the module setup, it was much easier to use and set up than BB.
4. I can't say enough about Canvas. It is an incredibly aesthetically pleasing system that features the ability to quickly and easily move files and interact in all areas of the LMS. The rubric feature is amazing, and I'd love to continue with Canvas to use even more features offered by Canvas, such as tracking mastery of objectives. The chat feature allowed for virtual office hours and additional support for students. The SpeedGrader is a dream. Canvas is the 4th LMS I've used in my academic career and it is by far the easiest to figure out and the best I've used. The customer service and instant chat was helpful to me several times. The discussion board was easy for students to use as well, and they were able to interact with each other and answer each other's questions while out on fieldwork during one week of the

semester. In addition, the mobile device and tablet compatibility is superb. I loved being able to incorporate mobile devices into the class. For example, students videoed themselves performing a certain clinical skill, then uploaded the video to Canvas and reviewed it for the purpose of completing a self-assessment and self-reflection of skills. The instructor was able to provide feedback and comment directly in Canvas as well.

5. It's intuitive and a delight to use!
6. So far, everything I have wanted an LMS to do, Canvas does without weird work-arounds or annoying things that get in the way. It seems to do all the basics quite well, and the basics are the thing that I spend the most time with.
7. So far I prefer Canvas to Blackboard. Many of the features are easier to use and don't suffer from the level of bloat/disorganization in Blackboard. That being said, there are a few aspects of Schoology that I think are better (in particular the grade book and rubrics are easier to use).
8. See earlier note--actually I just said I would very much like to use Canvas for my spring course. As it has a digital component, and I'm a newbie at this, I'd like to have software that would encourage me in this direction, not discourage me!
9. I have extensive online teaching experience with Canvas, Blackboard, and D2L. While there are things that I like and don't like about each platform, I find Canvas to be the easiest to use with the fewest "dislikes"

Faculty Open-Ended Survey Feedback (Schoology)

Below are several representative comments regarding pilot faculty's opinion of **Schoology**:

1. I'm actually between somewhat and strongly in agreement. I think the features and usability of Schoology is an improvement over Blackboard but can be improved with some tweaks. I particularly think that the user email functions can be improved and I don't think that the apparent third party Schoology go-through for west emails and the possible junk mail bounce.
2. It was useful and better than Blackboard, but still lacks some functionality. More drag & drop, especially for folders.
3. Overall Schoology has been very easy to use. The design and functionality of the course site is intuitive, and the mobile app is fantastic. I appreciated the ability to link course sections, so that modifications to the course site are reflected in all three sections. I've also found the grading feature to be extremely helpful for my course.
4. Schoology is by far the best system I've used all around. It's fast, can handle large courses (500 students), and is intuitive.
5. I am teaching 14 credit-hours this semester, including 9 hours of technical writing. Schoology has made this possible and even easy. I and my students are happy and calm, even at the end of a semester. It's surreal.
6. I think it's easy to use (easier than Blackboard, for example), flexible and accommodating (more so than Telesis & even Blackboard), and that there is great tech support. Yes, the tech support has been especially attentive in the test period, but there will always be a Wash U connection. Students had *no*

trouble with adjusting to a new LMS, and I had surprisingly little. I am sorry Schoology will not be available next semester.

7. I haven't had time to look into Canvas as much as I would have liked, but I am not sure I would want to work with Schoology for all my courses in the future. I also teach a completely online course in the summer and so the LMS is of key importance in that context, and while I really enjoyed the way in which Schoology appears very user-friendly and similar to other social media, it may seem more suitable for high schools than for universities. I would neither recommend it nor vote against it, but mostly for my lack of expertise with Canvas and my inability to compare the two of them. Sorry.
8. Many aspects of Schoology seem half-baked and unprofessional, especially the grading features and the silly Facebook-esque "social" veneer. It was difficult to set up grading for my TA. It's clear that Schoology was designed with the secondary education market in mind -- small classes run by a single teacher -- and it doesn't seem ready for higher ed.
9. I did not find Schoology to be sufficient for my needs and workflow. If we are going to change LMS, let's adopt one that will get the job done. It must be easy to use (above all else), self-explanatory, flexible, and equipped with functionality that is comparable to other systems we use. If Box can facilitate drag-and-drop and online file editing, why can't our LMS? I find this very frustrating. Especially when I was unable to activate the Box widget in Schoology.
10. It would be very unpleasant for me to use an LMS that does not support group work.
11. I just think there are more advanced LMS systems available for graduate level education.

B. Use Case Testing

User Survey Responses

Based on the faculty survey conducted in May/June 2017, responses were analyzed and parsed into a set of use cases (e.g., “I need to use a custom formula to calculate student grades” or “I need to know which students did and did not watch the video I posted”). This initial set of use cases was then expanded upon to add in cases that would be necessary, but hadn’t be specifically called out in the survey responses.

Once the full list was compiled, the use cases were reviewed and a small handful were removed due to being out of scope or not being a function that could be tested. For example, one survey respondent wanted the ability to run Python code directly through the LMS. Not only did our tester not have the necessary expertise in Python programming to execute such a test, it was decided that this functionality was out of scope for an LMS.

In all, 16 cases were eliminated, leaving a total of 96 use cases. Most were assigned to the user role of Instructor, but TA and Student use cases were also included. A small number of System Administrator tasks were also included.

Testing Methodology

Pre-Test Training

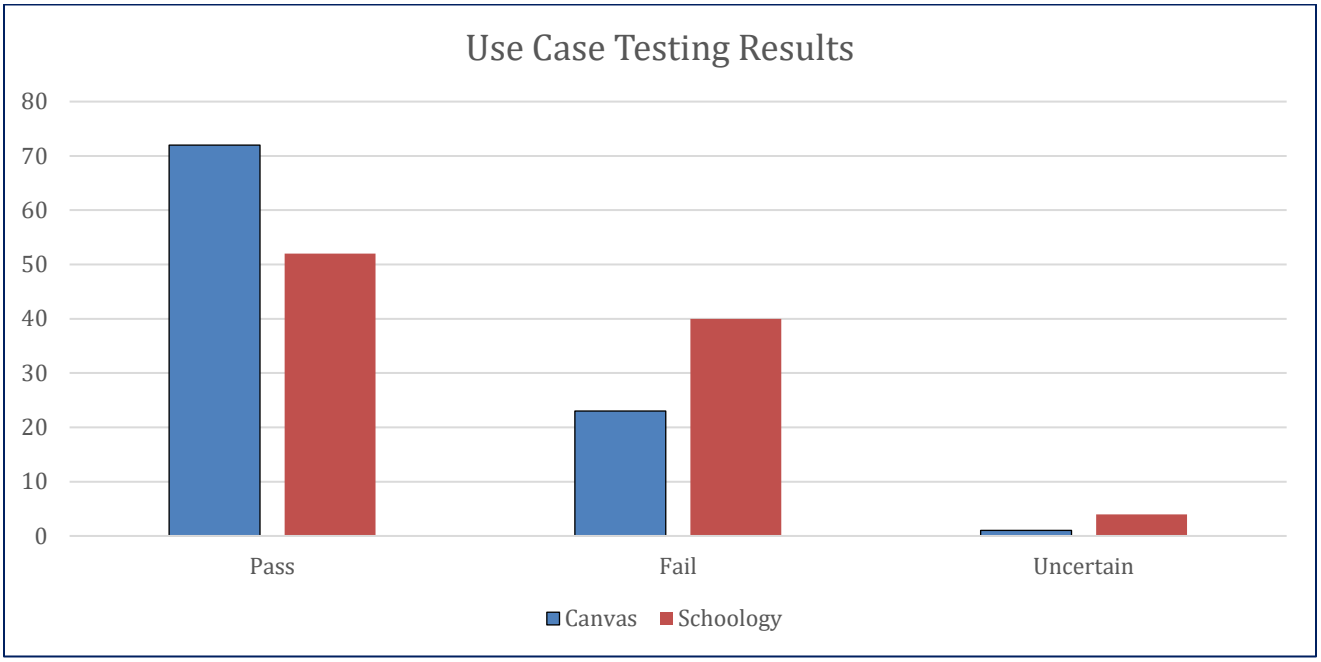
Our primary tester did not attend any of the training sessions before the testing. She did watch many of the training tutorials provided by the vendor. However, those were watched several weeks prior to testing, so only a

vague familiarity with the steps required to complete the tasks remained. We felt that going in "fresh," so to speak, would provide better insights to the relative usability of the two systems.

When a use case could not be completed without some instruction, the tutorial videos and online help were used. In such cases, the task was rated lower on usability. When neither tester could determine how to complete a task, despite referring to help guides and user forums, the use case was deemed a failure.

Summary of Results

After both testers evaluated the selected use cases, Schoology passed 52 cases, failed 40 cases, with four cases deemed uncertain (the full list of use cases analyzed can be found in Appendix F). Canvas passed 72 use cases, failed 23, and had one uncertain use case. These results are presented in the figure below.



Ease of Use Criteria

The most predominant theme in the May/June 2017 faculty survey responses was how difficult it is to use Blackboard. With that in mind, each successful use case was also ranked on Ease of Use from 0 to 5, with 5 being very easy. The criteria are as follows:

> 5 – A quick glance around the screen resulted in locating the right option. Labeled well, and pretty much where one would expected it to be.
>
> 4 – User had to search around a bit, look at hover tips, try to guess what the feature may be called or where it was located in the interface. Perhaps it was labeled something unusual or not where one might expected it to be.

3 – After some searching, the user couldn't determine the steps to take to complete the task and had to search help resources. The function was buried in and unexpected location, and/or not labeled in a recognizable way. However, eminent task failure was relatively easy to recover from with help.

2 – After referencing help resources the task was completed but it took an inordinate amount time and was very aggravating to accomplish even with assistance.

1 – Almost impossible to figure out the functionality even with help and/or User remained unsure the task was completed correctly even after following instructions.

0 – Complete failure. Topic not found in help resources, could not complete task and/or Feature not offered.

The table below shows the cumulative number of total ease points each system was awarded by the testers. The mean ease of use score per successful use case was 4.17 for Schoology, and 4.21 for Canvas, suggesting that both systems employed appropriate design principles to help untrained users complete tasks with relative ease.

Ease of Use Rankings 0 to 5 with 5 being very easy					
Schoology		Canvas		Total Possible	Summary
Points	% of Total	Points	% of Total	Points	**Winner: Canvas**
217	45.2%	303	63.1%	480	Earned 86 more ease of use points than Schoology Ranked 17.9% higher than Schoology

Schoology‡

Issues were ranked based on how significant their impact was on the user and how easy it was to recover from the issue.

Also identified were issues that could be ameliorated with workarounds and/or additional training.

Deeper dive

1. **Grading** -- There was only one issue I felt that my own skills were not adequate to evaluate properly and that was the Grading features. The options to customize grading schemes and build rubrics seemed easy, but I lack sufficient domain knowledge to test them rigorously.

‡ The comments and analysis in this section and the following section were provided by Teri Davis, WashU IT Business Analyst, and Cory Brant, Technology Services Specialist in Physical Therapy, and are written in first person.

Workaround/Training

1. **Importing test/quizzes** – Schoology only allows quiz imports from three other tools. There is no template provided, nor the ability to upload a CSV for example. Instructors would need to be aware of the limitations and workarounds.
2. **Surveys** – Instructors requested the ability to create surveys for their students to respond to. This feature is available, but not in an intuitive location. Emphasis in training materials could ease the difficulty of this feature.
3. **HTML Editor** – It was somewhat difficult to locate the HTML Editor and at first we believed the feature wasn't provided. Emphasis in training materials could ease the difficulty of this feature.
4. **Syllabus** – There isn't a clear and separate syllabus tool in Schoology. However, as course materials are uploaded, organized into folders, and scheduled, a course schedule is automatically generated. For more flexibility in Syllabus design, the document could be uploaded as a PDF or as an online page. There is flexibility in workarounds, but this should be brought out in training.
5. **Emailing Students** – Some instructors requested the ability to email students their grades, their key complaint being that it was a tedious process to email each student one by one. There was no automatic feature for this in Schoology. You could, however, bulk email students or post an update to notify them that their grades were posted and to log into the LMS to view their grades. Workarounds could be emphasized in training materials.
6. **Virtual Class (Live Online video, whiteboard, chat)** – At this time, these are features only offered with a third party tool. This could be its own training issue, how to accomplish this functionality and what the best tools are for it.
7. **Checking for Plagiarism** – Also handled with a third party tool, it would benefit the users to have this addressed in training.
8. **Course Availability** – It is not always easy to see which of your courses and/or course materials are available to the students (published vs. unpublished) as there is no visual indication on the screen. The user community would benefit from training on methods to identify when objects are available.

Low/Moderate Impact

1. **HTML Editor (Course Announcements)** – In almost all of the other course material modules, the HTML Editor, while not obvious to find, was there, with the exception of the Announcements feature. There was no way to embed HTML in the course announcements and this was a feature specifically requested on the survey.
2. **Student Notification** – It was requested that the instructors be able to see which students did or did not receive a notification for an announcement, assignment, quiz, etc. Neither LMS had this functionality nor did I find anything like a read receipt. The student has control over how they received their notifications, including turning them off completely.
3. **Emailing Students –** I was able to find the feature to email a single student and send the message. But the account doesn't have an email address and the system did not notify me of that. The system responded "Message sent" and of course, one never came. This won't likely be a problem because real students will have their university email entered by default. This false status response was concerning. What other features may give false positives?

4. **Import Grades from CSV** – There is no feature in Schoology that does this. Instructors would have to adapt to entering grades manually.
5. **Bulk Edit Grades** – Once instructor request was the ability to update grades in a batch all at once, for example selecting the column and pasting grades in. There is no feature in Schoology that does this. Instructors would have to adapt to entering grades manually.

Significant Impact

1. **Course Calendar**
    a. My chief concern with Schoology is the limitations of the course calendar. Quizzes/Tests, Assignments are automatically placed on the calendar, but only appear when the item is released to the students. I would think you may want your students to know when the exam will be well before you release the actual exam for the students to see.
    b. In addition to the issue above, as a student you can see your upcoming assignments by due date. However, there is no indication which course the item is for (only visible on hover) and there is no visual indication of completion. It would be more and more confusing the more courses you had to determine what you needed to complete, when, and for which course.
2. **Group Assignments** – Grading group assignments was another major concern. I assumed that the grade would go to all students in the group, but it only went to the one who handed it in. Had I not been specifically looking for it, I might not have noticed that the others in the group didn't receive their grade.
3. **Markup/Grading Tool** – The Markup grading tool is clunky and difficult to use. It's easy to make mistakes and difficult to recover from them.
4. **Views on Course Materials –** Many instructors expressed an interest in seeing which students did or did not view supplemental course materials like videos, blog entries. The system does not have this functionality.

Canvas

Issues were ranked based on how significant their impact on the user and how easy it was to recover from the issue. Also identified were issues that could be ameliorated with workarounds and/or additional training.

Deeper Dive

1. **Grading** -- There was only one issue I felt that my own skills were not adequate to evaluate properly and that was the Grading features. The options to customize grading schemes and build rubrics seemed easy and powerful, but I lack sufficient domain knowledge to test them rigorously.

Workaround/Training

1. **Virtual Class (Live Online video, whiteboard, chat)** – At this time, these are features only offered with a third party tool. This could be its own training issue, how to accomplish this functionality and what the best tools are for it.
2. **Checking for Plagiarism** – Also handled with a third party tool, it would benefit the users to have this addressed in training.

3. **Surveys** – Instructors requested the ability to create surveys for their students to respond to. This feature is available, but not in an intuitive location. Emphasis in training materials could ease the difficulty of this feature.
4. **Bulk Edit Grades** – One instructor request was the ability to update grades in a batch all at once, for example selecting the column and pasting grades in. There is no feature in Canvas that does this within the LMS, but instructors can export the gradebook, edit the output file and re-import the new grades.
5. **Markup/Grading Tool –** The markup/grading tool only seems to work on files the students upload, so you couldn't allow them to just enter text in the online editor if you wanted to mark it up for grading purposes.

Low/Moderate Impact

1. **Importing test/quizzes** – Canvas only allows quiz imports in a small number of specific formats. There is no template provided, nor the ability to upload a CSV for example. Instructors would need to be aware of the limitations and workarounds.
2. **TA Coordination** – There is no way that I could find to set up a private area for TAs and the Instructor to collaborate. For example, you can't set up a course discussion and assign it only to the TAs. Canvas only allows discussions to be assigned to Students. It could be possible with other features like the live conferencing, but those would require 3rd party tools.
3. **Student Notification** – It was requested that the instructors be able to see which students did or did not receive a notification for an announcement, assignment, quiz, etc. Neither LMS had this functionality nor did I find anything like a read receipt. The student has control over how they received their notifications, including turning them off completely.
4. **Attendance** – The interface is challenging in this module. Functionality is not clear. A table with dates across the top and students down the side would be easier/more familiar. However the seating chart feature is pretty cool.
5. **Emailing Students** – Some instructors requested the ability to email students their grades, their key complaint being that it was a tedious process to email each student one by one. There was no automatic feature for this in Canvas. You could, however, bulk email students or post an update to notify them that their grades were posted and to log into the LMS to view their grades. Workarounds could be emphasized in training materials.

Significant Impact

1. **Renaming of Student Files** – Canvas prepended the course name and assignment code on files submitted to assignments. This can create issues for instructors who have to have the files named very specifically. Since Canvas groups all of the submitted files together into the zip file, the course/assignment tags could be put on zip file without modifying the files themselves.
2. **Views on Course Materials –** Many instructors expressed an interest in seeing which students did or did not view supplemental course materials like videos, blog entries. Canvas does not have this functionality. You can see generally how many views and how long users spent, but you can't see the stats per student specifically.

C. Power User Focus Group

Toward the end of the pilot period, the LMS Review Committee invited faculty and staff members who had taught or designed and supported at least one course in both systems to discuss their opinions about the head-to-head merits of each.

Patricia McGee (Physical Therapy), Bill Siever (Computer Science and Engineering), and Richard Abrams (Psychological and Brain Sciences) represented faculty users, while Barb Norton (Physical Therapy), Ashby Tyler (Social Work), and Jason Crandall (Engineering Information Technology) shared feedback from a staff support perspective. The co-chairs of the Teaching and Learning Domain Committee and the LMS Review Committee were also present.

Primary questions discussed were, “What did you like most about each system? What were the biggest gaps you encountered? Which system would you prefer to use?” Three of the six users in the focus group expressed an unambiguous preference for Canvas, while the remaining three users had some reservations about both systems but were comfortable recommending either to replace Blackboard. All members noted some shortcomings with both systems, but the most serious concerns were certain missing features from Schoology, to the extent that one user felt she could not adequately teach with Schoology.

Conclusion

Based on these data, we are confident that the recommendation of Canvas is consistent with the feedback and the experiences of faculty, staff, and students who participated in this pilot. We look forward to answering any questions the community may have about these recommendations.

Appendix A. Spring 2017 LMS Feedback Survey

At the request of the Office of the CIO, the Teaching & Learning Domain LMS Review Sub-Committee is soliciting feedback on the Learning Management System (LMS). We value your candid feedback.

Q1 **What is your primary role at WashU?**

- o Faculty
- o Staff
- o Undergraduate Student
- o Graduate Student
- o Other (please specify) _____

Q2 **What is your primary affiliation?**

- o Arts & Sciences
- o Brown School
- o Olin Business School
- o Sam Fox School of Design & Visual Arts
- o School of Engineering & Applied Science
- o School of Law
- o School of Medicine
- o Other (please specify) _____

Q3 **What is your primary Learning Management System (LMS)?**

- o Blackboard LMS
- o Canvas LMS
- o Schoology LMS
- o I don't use an LMS currently.
- o Other (please specify) _____

Q4 **How would you describe your level of expertise on your primary LMS?**

- o Beginner
- o Intermediate
- o Advanced
- o I don't use an LMS.

Q5 **How many semesters have you used your primary LMS?**

- o 0
- o 1 to 2 semesters
- o 3 to 4 semesters

- o More than 4 semesters

Q6 **What functionality do you currently make use of in your primary LMS? (select all that apply)**

- ▢ Posting and accessing documents (syllabus, slides, spreadsheets, etc.)
- ▢ Exchanging files
- ▢ Online discussions
- ▢ Making announcements
- ▢ Scheduling/Calendaring
- ▢ Quizzes/Exams
- ▢ Surveys
- ▢ Chat
- ▢ Assignments
- ▢ Gradebook
- ▢ Other (please specify) _____

Q7 ***Rate your agreement or disagreement with the following statements***

An LMS platform can be valuable to me by:

	Strongly agree	**Somewhat agree**	**Neither agree nor disagree**	**Somewhat disagree**	**Strongly disagree**
Improving teaching and learning	)	)	)	)	)
Saving time	)	)	)	)	)
Accessing material any time from any location (convenience)	)	)	)	)	)
Managing course activities	)	)	)	)	)
Improving student-faculty communication	)	)	)	)	)
Improving student-student communication	)	)	)	)	)
Collaborating with classmates, colleagues, peers	)	)	)	)	)

Q8 **I would like for the new LMS environment to support my WashU activities by providing these options or benefits:**

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Integrated access to library resources	o	o	o	o	o
Individual instructor / student storage space within LMS	o	o	o	o	o
Content repositories for sharing materials within a group, department, or school	o	o	o	o	o
Providing feedback on my performance in course activities / providing reports on students' performance in course activities	o	o	o	o	o
ePortfolios to showcase accomplishments and learning	o	o	o	o	o
Email notification about new resources and new activity	o	o	o	o	o
RSS/news feed notification about new resources and new activity	o	o	o	o	o
Supporting my collaboration with classmates, colleagues, or peers on written work	o	o	o	o	o
Ease of access to emerging educational and collaboration tools (wikis, blogs, podcasts/vodcasts, etc.)	o	o	o	o	o
Facilitating online course evaluations	o	o	o	o	o
Plagiarism detection	o	o	o	o	o
Customizable user calendar	o	o	o	o	o

Supporting real-time remote meetings, presentations, or discussions (whiteboard, polling, chat, etc.)	o	o	o	o	o
Robust mobile integration/support (calendar, announcements, etc.)	o	o	o	o	o
Tracking of learner usage, progress, activities; early warning/retention system	o	o	o	o	o
Advanced grading options (e.g., rubrics, outcomes, competencies)	o	o	o	o	o
Allowing creation of organizations, committee, or other non-curricular sites	o	o	o	o	o
Other activity:	o	o	o	o	o

Q9 **What do you perceive as the most significant drawbacks or barriers to using an LMS or similar environment? (select all that apply)**

- ▢ I do not have time to **learn** an LMS.
- ▢ I do not have time to **use** an LMS.
- ▢ I do not have anyone to teach me how to use an LMS to meet my goals.
- ▢ The current LMS tools do not support my work at WashU.
- ▢ LMS tools are too inflexible, tedious, or complicated to use.
- ▢ The LMS is not reliable.
- ▢ I have never had a reason or desire to use an LMS.
- ▢ I think introducing an LMS would produce unfavorable changes in my courses.
- ▢ I do not perceive any significant drawbacks or barriers to using an LMS.
- ▢ Other (please specify) _____

Q10 **Please include any other comments you'd like to share about past experience using an LMS or your future goals for a new environment:**

_____

_____

Appendix B. Fall 2017 Faculty LMS Evaluation Items

1.1 **Survey Purpose**

You are invited to participate in the survey because you are using one of the LMS (Learning Management Systems) for the WashU pilot. The purpose of this survey is to learn more about faculty use and perceptions of each LMS. This survey is being conducted by the Teaching & Learning Domain Committee under the direction of the CIO's office and the results of this survey will inform the selection of a new LMS for the university.

The survey will take approximately 10-15 minutes to complete. If you have any questions about the pilot evaluation, please contact Jason Crandall (jasoncrandall@wustl.edu). Please click "Next" below to begin the survey.

2.1 Name

_____

2.2 Course

_____

2.3 Which LMS did you use in your pilot course this semester?

- o Canvas
- o Schoology

3.1 On average, how many hours per week have you spent using [Canvas/Schoology] for your course this semester?

- o Less than 1 hour
- o 1 to 5 hours
- o 5 to 10 hours
- o 10 to 15 hours
- o More than 15 hours

4.1 Overall, navigation and finding what I am looking for in [Canvas/Schoology] is...

- o Extremely easy
- o Somewhat easy
- o Neither easy nor difficult
- o Somewhat difficult
- o Extremely difficult

4.2 In [Canvas/Schoology], it was **easy to use**: Mark only one choice per row.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	I didn't use this feature of [Canvas/ Schoology]
Activity feed	o	o	o	o	o	o
Announcements/Updates	o	o	o	o	o	o
Assignments	o	o	o	o	o	o
Discussions	o	o	o	o	o	o
Syllabus	o	o	o	o	o	o
Tests/Quizzes	o	o	o	o	o	o
Files	o	o	o	o	o	o
Modules/Folders	o	o	o	o	o	o
Pages	o	o	o	o	o	o
Collaborations	o	o	o	o	o	o
Inbox/Messages	o	o	o	o	o	o
Chat	o	o	o	o	o	o
Calendar	o	o	o	o	o	o

4.3 (Optional) Please comment on your experience with any of the above features.

_____

_____

5.1 Each LMS can provide data on student engagement with course learning materials and overall course performance. Below are several different types of analytic data you may have had access to in your course. Please rate how useful you found each category of analytics for your teaching in [Canvas/Schoology] this term (If you didn't use the analytics, please skip to question 6.1).

Mark only one choice per row.

	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	I didn't use this feature of [Canvas/ Schoology]
Course-level (e.g., most recent access, time on site)	o	o	o	o	o	o
Student-level (e.g., progress, completion)	o	o	o	o	o	o
Assignment & quiz statistics (e.g., mean score, grade distribution)	o	o	o	o	o	o
Content-level (e.g., clicks/views per video)	o	o	o	o	o	o

5.2 Please describe how you are using analytics in [Canvas/Schoology].

_____

_____

_____

6.1 How **helpful** was [Canvas/Schoology] for each of the following activities?
Mark only one choice per row.

	Not at all Helpful	Somewhat Helpful	Very Helpful	I didn't use this feature of [Canvas/ Schoology]
Sharing course materials and activities with students	o	o	o	o
Organizing course materials and activities for students	o	o	o	o
Helping students prepare for assessments	o	o	o	o
Answering student questions	o	o	o	o

Providing feedback on homework and assignments	o	o	o	o
Tracking student progress in the course	o	o	o	o
Communicating course updates and changes with my students	o	o	o	o
Collaborating with TAs and other instructors in the course	o	o	o	o
Computing and sharing course grades with students	o	o	o	o

6.2 (Optional) Please comment on your experience with the LMS for performing any of the above activities.

_____

_____

_____

7.1 Agree or disagree: I would like [Canvas/Schoology] to be the LMS I use for my courses at Washington University.

- o Strongly agree
- o Somewhat agree
- o Neither agree nor disagree
- o Somewhat disagree
- o Strongly disagree

7.2 Please explain your response above.

_____

_____

_____

8.1 How often did you experience any technical difficulties using [Canvas/Schoology] (i.e., login issues, system outages, etc.)?

- o Never
- o 1-2 times

- o 3-5 times
- o 5-10 times
- o More than 10 times

8.2 Please describe the technical problems you had.

_____

_____

_____

9.1 How many semesters (including this one) have you used Blackboard?

- o None (Blackboard has not been used in any of my previous or current courses)
- o 1 (This is my first semester using Blackboard)
- o 2 or more

10.1 Please identify which system you would prefer to use for each of the following learning activities. If you have no preference, choose "No preference".

Mark only one choice per row.

	Blackboard	**No preference**	**[Canvas/Schoology]**
Sharing course materials and activities with students	o	o	o
Organizing course materials and activities for students	o	o	o
Helping students prepare for assessments	o	o	o
Answering student questions	o	o	o
Providing feedback on homework and assignments	o	o	o
Tracking student progress in the course	o	o	o
Communicating course updates and changes to my students	o	o	o

Collaborating with TA's and other instructors in the course	o	o	o
Computing and sharing course grades with students	o	o	o

10.2 Compared to Blackboard, [Canvas/Schoology] is...

	Strongly agree	**Somewhat agree**	**Neither agree nor disagree**	**Somewhat disagree**	**Strongly disagree**
easier to learn	o	o	o	o	o
easier to use	o	o	o	o	o
better at supporting my students' learning	o	o	o	o	o
better at supporting effective teaching	o	o	o	o	o

Appendix C. Faculty LMS Evaluation Analysis

This table shows the results of statistical tests that examined responses in the survey. For each question, responses of the Canvas users were compared to those of the Schoology users. Two statistical tests were computed for each question--the Student's t-test and a more conservative Mann-Whitney test.

P-values in the column "p" show the probability that the observed difference between Schoology and Canvas responses is due to chance. P-values less than .05 indicate a statistically significant difference and are highlighted in yellow. For most items, both tests lead to the same conclusion.

Average response values (and other statistics) for each question are shown in the "Descriptives" table that follows. These analyses were performed by Richard Abrams, Professor of Psychological and Brain Sciences.

	Test	statistic[4]	df	p
On average, how many hours per week have you spent using [the Pilot System] for your course this semester?	Student's	1.041	47.000	0.303
	Mann-Whitney	337.500		0.373
Overall, navigation and finding what I am looking for in [the Pilot System] is? [5= Extremely easy, 1=Extremely difficult]	Student's	1.692	46.000	0.097
	Mann-Whitney	371.000		0.050
Easy to use?: Activity feed [5= Strongly agree, 1= Strongly disagree]	Student's	0.050	21.000	0.961
	Mann-Whitney	65.000		0.907
Easy to use?: Announcements/Updates [5= Strongly agree, 1= Strongly disagree]	Student's	0.192	40.000	0.849
	Mann-Whitney	238.000		0.609
Easy to use?: Assignments [5= Strongly agree, 1= Strongly disagree]	Student's	0.381	43.000	0.705
	Mann-Whitney	265.000		0.669
Easy to use?: Discussions [5= Strongly agree, 1= Strongly disagree]	Student's	0.712	21.000	0.484
	Mann-Whitney	71.000		0.656
Easy to use?: Syllabus [5= Strongly agree, 1= Strongly disagree]	Student's	0.391	34.000	0.698
	Mann-Whitney	139.500		0.952

[4] A positive value in the “Student’s” row in this column means that the responses for Canvas were numerically greater than for Schoology.

Easy to use?: Tests/Quizzes [5= Strongly agree, 1= Strongly disagree]	Student's	1.821	16.000	0.087	
	Mann-Whitney	47.000		0.080	
Easy to use?: Files [5= Strongly agree, 1= Strongly disagree]	Student's	-0.037	44.000	0.971	
	Mann-Whitney	243.000		0.597	
Easy to use?: Modules/Folders[5= Strongly agree, 1= Strongly disagree]	Student's	0.000	36.000	1.000	
	Mann-Whitney	158.000		0.386	
Easy to use?:Pages[5= Strongly agree, 1= Strongly disagree]	Student's	-0.042	19.000	0.967	
	Mann-Whitney	51.500		1.000	
Easy to use?: Collaborations[5= Strongly agree, 1= Strongly disagree]	Student's	0.192	7.000	0.853	
	Mann-Whitney	10.000		1.000	
Easy to use?: Inbox/Messages[5= Strongly agree, 1= Strongly disagree]	Student's	0.675	31.000	0.505	
	Mann-Whitney	160.500		0.334	
Easy to use?: Chat[5= Strongly agree, 1= Strongly disagree]	Student's	0.756	2.000	0.529	
	Mann-Whitney	2.500		0.637	
Easy to use?: Calendar[5= Strongly agree, 1= Strongly disagree]	Student's	2.252	26.000	0.033	a
	Mann-Whitney	130.500		0.053	a
Usefulness of Analytics: Course-level (e.g., most recent access, time on site)[5= Extremely useful, 1= Not at all useful]	Student's	-0.017	20.000	0.986	
	Mann-Whitney	59.000		1.000	
Usefulness of Analytics: Student-level (e.g., progress, completion)[5= Extremely useful, 1= Not at all useful]	Student's	0.651	20.000	0.523	a
	Mann-Whitney	65.000		0.673	a
Usefulness of Analytics: Assignment & quiz statistics (e.g., mean score, grade distribution)[5= Extremely useful, 1= Not at all useful]	Student's	0.360	24.000	0.722	
	Mann-Whitney	76.500		0.804	
Usefulness of Analytics: Content-level (e.g., clicks/views per video)[5= Extremely useful, 1= Not at all useful]	Student's	0.072	12.000	0.944	

	Mann-Whitney	27.000		0.733	
Helpfulness: Sharing course materials and activities with students [3= Very helpful, 1= Not at all helpful]	Student's	0.826	44.000	0.413	
	Mann-Whitney	276.000		0.422	
Helpfulness: Organizing course materials and activities for students [3= Very helpful, 1= Not at all helpful]	Student's	0.288	43.000	0.775	
	Mann-Whitney	257.500		0.786	
Helpfulness: Helping students prepare for assessments [3= Very helpful, 1= Not at all helpful]	Student's	0.372	26.000	0.713	
	Mann-Whitney	100.000		0.727	
Helpfulness: Answering student questions [3= Very helpful, 1= Not at all helpful]	Student's	0.789	28.000	0.437	
	Mann-Whitney	129.000		0.303	
Helpfulness: Providing feedback on homework and assignments [3= Very helpful, 1= Not at all helpful]	Student's	0.704	27.000	0.487	
	Mann-Whitney	114.000		0.616	
Helpfulness: Tracking student progress in the course [3= Very helpful, 1= Not at all helpful]	Student's	-0.537	28.000	0.596	
	Mann-Whitney	101.500		0.608	
Helpfulness: Communicating course updates and changes with my students [3= Very helpful, 1= Not at all helpful]	Student's	1.227	41.000	0.227	
	Mann-Whitney	270.000		0.152	
Helpfulness: Collaborating with TAs and other instructors in the course [3= Very helpful, 1= Not at all helpful]	Student's	1.369	6.000	0.220	a
	Mann-Whitney	10.000		0.302	a
Helpfulness: Computing and sharing course grades with students [3= Very helpful, 1= Not at all helpful]	Student's	0.180	35.000	0.858	
	Mann-Whitney	168.500		0.910	
Agree or disagree: I would like [the Pilot System] to be the LMS I use for my courses at Washington University. [5= Strongly agree, 1= Strongly disagree]	Student's	3.914	45.000	< .001	a
	Mann-Whitney	421.000		< .001	a

How often did you experience any technical difficulties using [the Pilot System] (i.e., login issues, system outages, etc.)? [1= ""Never"", 2= ""1-2 times"", 3= ""3-5 times"", 4= ""5-10 times"", 5= ""More than 10 times""]	Student's	-4.190[5]	45.000	< .001	
	Mann-Whitney	84.000		< .001	
How many semesters (including this one) have you used Blackboard? [1 = None, 2= First semester, 3= 2 or more semesters]	Student's	1.151	45.000	0.256	a
	Mann-Whitney	304.000		0.259	a
LMS preference: Sharing course materials and activities with students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	-0.094	39.000	0.926	
	Mann-Whitney	207.500		0.912	
LMS preference: Organizing course materials and activities for students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	-0.094	39.000	0.926	
	Mann-Whitney	207.500		0.912	
LMS preference: Helping students prepare for assessments [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	0.662	39.000	0.512	
	Mann-Whitney	225.500		0.515	
LMS preference: Answering student questions [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	1.817	39.000	0.077	
	Mann-Whitney	262.500		0.070	
LMS preference: Providing feedback on homework and assignments [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	1.700	39.000	0.097	a
	Mann-Whitney	252.000		0.147	a
LMS preference: Tracking student progress in the course [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	1.616	39.000	0.114	a
	Mann-Whitney	247.500		0.178	a
LMS preference: Communicating course updates and changes to my students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	0.136	39.000	0.893	
	Mann-Whitney	216.000		0.728	

[5] The negative value means that there were more technical difficulties with Schoology.

LMS preference: Collaborating with TA's and other instructors in the course [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	1.597	39.000	0.118	
	Mann-Whitney	256.000		0.121	
LMS preference: Computing and sharing course grades with students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Student's	1.139	39.000	0.262	
	Mann-Whitney	250.500		0.138	
Compared to Blackboard, [the Pilot System] is: easier to learn [5= Strongly agree, 1= Strongly disagree]	Student's	0.773	39.000	0.444	
	Mann-Whitney	254.500		0.133	
Compared to Blackboard, [the Pilot System] is: easier to use [5= Strongly agree, 1= Strongly disagree]	Student's	0.930	39.000	0.358	
	Mann-Whitney	262.000		0.080	
Compared to Blackboard, [the Pilot System] is: better at supporting my students' learning [5= Strongly agree, 1= Strongly disagree]	Student's	1.575	39.000	0.123	
	Mann-Whitney	257.500		0.137	
Compared to Blackboard, [the Pilot System] is: better at supporting effective teaching [5= Strongly agree, 1= Strongly disagree]	Student's	1.746	39.000	0.089	
	Mann-Whitney	281.500		0.028	

Descriptives

	Group	N	Mean	SD	SE
On average, how many hours per week have you spent using [the Pilot System] for your course this semester?	Canvas	27	4.556	4.642	0.893
	Schoology	22	3.318	3.414	0.728
Overall, navigation and finding what I am looking for in [the Pilot System] is? [5= Extremely easy, 1=Extremely difficult]	Canvas	26	4.423	0.758	0.149
	Schoology	22	4.045	0.785	0.167
Easy to use?: Activity feed [5= Strongly agree, 1= Strongly disagree]	Canvas	14	4.571	0.756	0.202
	Schoology	9	4.556	0.726	0.242
Easy to use?: Announcements/Updates [5= Strongly agree, 1= Strongly disagree]	Canvas	22	4.500	0.913	0.195
	Schoology	20	4.450	0.759	0.170
Easy to use?: Assignments [5= Strongly agree, 1= Strongly disagree]	Canvas	25	4.640	0.757	0.151
	Schoology	20	4.550	0.826	0.185
Easy to use?: Discussions [5= Strongly agree, 1= Strongly disagree]	Canvas	13	4.769	0.439	0.122
	Schoology	10	4.600	0.699	0.221
Easy to use?: Syllabus [5= Strongly agree, 1= Strongly disagree]	Canvas	25	4.560	0.651	0.130
	Schoology	11	4.455	0.934	0.282
Easy to use?: Tests/Quizzes [5= Strongly agree, 1= Strongly disagree]	Canvas	13	4.769	0.599	0.166
	Schoology	5	4.000	1.225	0.548
Easy to use?: Files [5= Strongly agree, 1= Strongly disagree]	Canvas	26	4.692	0.618	0.121
	Schoology	20	4.700	0.801	0.179
Easy to use?: Modules/Folders[5= Strongly agree, 1= Strongly disagree]	Canvas	19	4.684	0.478	0.110
	Schoology	19	4.684	0.820	0.188
Easy to use?:Pages[5= Strongly agree, 1= Strongly disagree]	Canvas	13	4.615	0.506	0.140
	Schoology	8	4.625	0.518	0.183
Easy to use?: Collaborations[5= Strongly agree, 1= Strongly disagree]	Canvas	4	4.000	1.414	0.707
	Schoology	5	3.800	1.643	0.735

Easy to use?: Inbox/Messages[5= Strongly agree, 1= Strongly disagree]	Canvas	18	4.056	1.392	0.328
	Schoology	15	3.733	1.335	0.345
Easy to use?: Chat[5= Strongly agree, 1= Strongly disagree]	Canvas	1	5.000	NaN	NaN
	Schoology	3	3.667	1.528	0.882
Easy to use?: Calendar[5= Strongly agree, 1= Strongly disagree]	Canvas	17	4.647	0.606	0.147
	Schoology	11	3.818	1.328	0.400
Usefulness of Analytics: Course-level (e.g., most recent access, time on site)[5= Extremely useful, 1= Not at all useful]	Canvas	13	3.769	1.235	0.343
	Schoology	9	3.778	0.972	0.324
Usefulness of Analytics: Student-level (e.g., progress, completion)[5= Extremely useful, 1= Not at all useful]	Canvas	13	4.077	0.862	0.239
	Schoology	9	3.778	1.302	0.434
Usefulness of Analytics: Assignment & quiz statistics (e.g., mean score, grade distribution)[5= Extremely useful, 1= Not at all useful]	Canvas	18	4.389	0.850	0.200
	Schoology	8	4.250	1.035	0.366
Usefulness of Analytics: Content-level (e.g., clicks/views per video)[5= Extremely useful, 1= Not at all useful]	Canvas	8	3.875	1.246	0.441
	Schoology	6	3.833	0.753	0.307
Helpfulness: Sharing course materials and activities with students [3= Very helpful, 1= Not at all helpful]	Canvas	26	2.962	0.196	0.038
	Schoology	20	2.900	0.308	0.069
Helpfulness: Organizing course materials and activities for students [3= Very helpful, 1= Not at all helpful]	Canvas	25	2.880	0.332	0.066
	Schoology	20	2.850	0.366	0.082
Helpfulness: Helping students prepare for assessments [3= Very helpful, 1= Not at all helpful]	Canvas	17	2.706	0.470	0.114
	Schoology	11	2.636	0.505	0.152
Helpfulness: Answering student questions [3= Very helpful, 1= Not at all helpful]	Canvas	18	2.667	0.594	0.140
	Schoology	12	2.500	0.522	0.151
Helpfulness: Providing feedback on homework and assignments [3= Very helpful, 1= Not at all helpful]	Canvas	16	2.688	0.479	0.120
	Schoology	13	2.538	0.660	0.183

Helpfulness: Tracking student progress in the course [3= Very helpful, 1= Not at all helpful]	Canvas	17	2.765	0.437	0.106
	Schoology	13	2.846	0.376	0.104
Helpfulness: Communicating course updates and changes with my students [3= Very helpful, 1= Not at all helpful]	Canvas	24	2.833	0.482	0.098
	Schoology	19	2.632	0.597	0.137
Helpfulness: Collaborating with TAs and other instructors in the course [3= Very helpful, 1= Not at all helpful]	Canvas	5	3.000	0.000	0.000
	Schoology	3	2.667	0.577	0.333
Helpfulness: Computing and sharing course grades with students [3= Very helpful, 1= Not at all helpful]	Canvas	22	2.636	0.581	0.124
	Schoology	15	2.600	0.632	0.163
Agree or disagree: I would like [the Pilot System] to be the LMS I use for my courses at Washington University. [5= Strongly agree, 1= Strongly disagree]	Canvas	26	4.577	0.902	0.177
	Schoology	21	3.190	1.504	0.328
How often did you experience any technical difficulties using [the Pilot System] (i.e., login issues, system outages, etc.)? [1= ""Never"", 2= ""1-2 times"", 3= ""3-5 times"", 4= ""5-10 times"", 5= ""More than 10 times""]	Canvas	26	1.346	0.745	0.146
	Schoology	21	2.238	0.700	0.153
How many semesters (including this one) have you used Blackboard? [1 = None, 2= First semester, 3= 2 or more semesters]	Canvas	26	2.846	0.543	0.107
	Schoology	21	2.619	0.805	0.176
LMS preference: Sharing course materials and activities with students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.750	0.532	0.109
	Schoology	17	0.765	0.437	0.106
LMS preference: Organizing course materials and activities for students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.750	0.532	0.109
	Schoology	17	0.765	0.437	0.106
LMS preference: Helping students prepare for assessments [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.458	0.509	0.104
	Schoology	17	0.353	0.493	0.119
LMS preference: Answering student questions [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.708	0.550	0.112
	Schoology	17	0.353	0.702	0.170

LMS preference: Providing feedback on homework and assignments [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.667	0.482	0.098
	Schoology	17	0.353	0.702	0.170
LMS preference: Tracking student progress in the course [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.708	0.464	0.095
	Schoology	17	0.412	0.712	0.173
LMS preference: Communicating course updates and changes to my students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.500	0.722	0.147
	Schoology	17	0.471	0.624	0.151
LMS preference: Collaborating with TA's and other instructors in the course [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.417	0.584	0.119
	Schoology	17	0.118	0.600	0.146
LMS preference: Computing and sharing course grades with students [-1 = Blackboard, 0 = No preference, 1 = the Pilot System]	Canvas	24	0.667	0.702	0.143
	Schoology	17	0.412	0.712	0.173
Compared to Blackboard, [the Pilot System] is: easier to learn [5= Strongly agree, 1= Strongly disagree]	Canvas	24	4.500	0.933	0.190
	Schoology	17	4.294	0.686	0.166
Compared to Blackboard, [the Pilot System] is: easier to use [5= Strongly agree, 1= Strongly disagree]	Canvas	24	4.542	0.932	0.190
	Schoology	17	4.294	0.686	0.166
Compared to Blackboard, [the Pilot System] is: better at supporting my students' learning [5= Strongly agree, 1= Strongly disagree]	Canvas	24	4.208	0.932	0.190
	Schoology	17	3.706	1.105	0.268
Compared to Blackboard, [the Pilot System] is: better at supporting effective teaching [5= Strongly agree, 1= Strongly disagree]	Canvas	24	4.417	0.929	0.190
	Schoology	17	3.941	0.748	0.181

Appendix D. Fall 2017 Student LMS Evaluation Items

Survey Purpose

You are invited to participate in the survey because you are using one of the LMS (Learning Management Systems) for the WashU pilot. The purpose of this survey is to learn more about student use and perceptions of each LMS and to help inform our decision about which system to select. This survey is being conducted by the Teaching & Learning Domain Committee under the direction of the CIO's office.

The survey will take approximately 10-15 minutes to complete. If you have any questions about the pilot evaluation, please contact Jason Crandall (jasoncrandall@wustl.edu). Please click "Next" below to begin the survey.

1. Besides Blackboard, which LMS did you use in your pilot course this semester?

- O Schoology
- O Canvas

2. On average, how many hours per week have you spent using [the Pilot System] for your course this semester?

- O Less than 1 hour
- O 1 to 5 hours
- O 5 to 10 hours
- O 10 to 15 hours
- O More than 15 hours

Please use the table below to indicate the extent to which you agree with the following statements. Mark only one choice per row.

3a. In [the Pilot System], it was **easy to use**:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	I didn't use this feature of [the Pilot System]
Announcements/ Updates	O	O	O	O	O	O
Activity feed	O	O	O	O	O	O
Assignments	O	O	O	O	O	O
Discussions	O	O	O	O	O	O
Syllabus	O	O	O	O	O	O
Tests/Quizzes	O	O	O	O	O	O
Files	O	O	O	O	O	O
Modules/Folders	O	O	O	O	O	O
Collaborations	O	O	O	O	O	O
Inbox/Messages	O	O	O	O	O	O
Chat	O	O	O	O	O	O
Calendar	O	O	O	O	O	O

3b. (Optional) Please comment on your experience with any of the above features.

_____

_____

Please use the table below to indicate the extent to which you agree with the following statements. Mark only one choice per row.

4a. How **helpful** was [the Pilot System] for each of the following activities?

	Not at all Helpful	Somewhat Helpful	Very Helpful	I didn't use this feature of [the Pilot System]
Accessing course materials	O	O	O	O
Studying for exams	O	O	O	O
Submitting homework and assignments	O	O	O	O
Checking my progress in the course	O	O	O	O
Communicating with my instructor(s)	O	O	O	O
Communicating with other students in the course	O	O	O	O
Monitoring the due dates for assignments and course activities	O	O	O	O
Reviewing feedback on homework and assignments	O	O	O	O

4b. (Optional) Please comment on your experience with the LMS for performing any of the above activities.

_____

_____

5. (Optional) What was most effective about how [the Pilot System] is used in this course?

_____

_____

6. (Optional) What was least effective about how [the Pilot System] is used in this course?

_____

_____

7a. Agree or disagree: I would like [the Pilot System] to be the standard LMS for my courses at Washington University.

O Strongly agree

O Somewhat agree

O Neither agree nor disagree

O Somewhat disagree

O Strongly disagree

7b. (Optional) Please explain your response above.

_____

_____

8a. How often did you experience any technical difficulties using [the Pilot System] (i.e., login issues, system outages, etc.)?

- O Never
- O 1-2 times
- O 3-5 times
- O 5-10 times
- O More than 10 times

8b. Please describe the technical problems you had, and what process you took to resolve them (if applicable).

_____

_____

9. How many semesters (including this one) have you used Blackboard?

- O None (Blackboard has not been used in any of my previous or current courses)
- O 1 (This is my first semester using Blackboard)
- O 2 or more

10. Please identify which system you would prefer to use for each of the following learning activities. If you have no preference, choose "No preference".

Mark only one choice per statement.

	Blackboard	No preference	[the Pilot System]
Accessing course materials	O	O	O
Studying for exams	O	O	O
Submitting homework and assignments	O	O	O
Checking my progress in the course	O	O	O
Communicating with my instructor(s)	O	O	O
Communicating with other students in the course	O	O	O
Monitoring the due dates for assignments and course activities	O	O	O
Reviewing feedback on homework and assignments	O	O	O

11. Compared to Blackboard, [the Pilot System] is...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
easier to learn	O	O	O	O	O
easier to use	O	O	O	O	O
more effective for my learning	O	O	O	O	O
more valuable to my course experience	O	O	O	O	O

Appendix E. Student LMS Evaluation Analysis

This table shows the results of statistical tests that examined responses in the survey. For each question, responses of the Canvas users were compared to those of the Schoology users. Two statistical tests were computed for each question--the Student's t-test and a more conservative Mann-Whitney test.

P-values in the column "p" show the probability that the observed difference between Schoology and Canvas responses is due to chance. P-values less than .05 indicate a statistically significant difference and are highlighted in yellow. For most items, both tests lead to the same conclusion.

Average response values (and other statistics) for each question are shown in the "Descriptives" table that follows. These analyses were performed by Richard Abrams, Professor of Psychological and Brain Sciences.

	Test	statistic[6]	df	p	
2. On average, how many hours per week have you spent using [the Pilot system] for your course this semester?	Student's	4.049	608.0	< .001[7]	[a]
	Mann-Whitney	49709.000		< .001	[a]
3a. In [the Pilot system], it was easy to use: - Announcements/Updates [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.670	544.0	0.096	
	Mann-Whitney	34392.500		0.096	
3a. In [the Pilot system], it was easy to use: - Activity feed [1 = Strongly disagree, 5 = Strongly agree]	Student's	0.694	463.0	0.488	
	Mann-Whitney	24145.000		0.307	
3a. In [the Pilot system], it was easy to use: - Assignments [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.882	574.0	0.060	
	Mann-Whitney	40870.500		0.008	
3a. In [the Pilot system], it was easy to use: - Discussions [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.631	392.0	0.104	
	Mann-Whitney	18639.500		0.056	
3a. In [the Pilot system], it was easy to use: - Syllabus [1 = Strongly disagree, 5 = Strongly agree]	Student's	2.728	522.0	0.007	
	Mann-Whitney	33471.500		0.001	

[6] Positive t statistics (the "Student's" row) indicate that Canvas received numerically higher ratings than Schoology.
[7] Students using Canvas spent more time using it than the Schoology students spent using Schoology. This could theoretically have affected the other ratings. On the other hand, it is also possible that people spent more time using Canvas because they liked it more and found it easier to use.

3a. In [the Pilot system], it was easy to use: - Tests/Quizzes [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.594	345.0	0.112	
	Mann-Whitney	12973.000		0.048[8]	
3a. In [the Pilot system], it was easy to use: - Files [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.210	509.0	0.227	
	Mann-Whitney	30691.000		0.065	
3a. In [the Pilot system], it was easy to use: - Modules/Folders [1 = Strongly disagree, 5 = Strongly agree]	Student's	0.223	498.0	0.824	
	Mann-Whitney	27119.500		0.423	
3a. In [the Pilot system], it was easy to use: - Collaborations [1 = Strongly disagree, 5 = Strongly agree]	Student's	0.022	253.0	0.982	
	Mann-Whitney	6924.000		0.659	
3a. In [the Pilot system], it was easy to use: - Inbox/Messages [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.381	373.0	0.168	
	Mann-Whitney	16755.000		0.159	
3a. In [the Pilot system], it was easy to use: - Chat [1 = Strongly disagree, 5 = Strongly agree]	Student's	-0.073	190.0	0.942	[a]
	Mann-Whitney	3970.500		0.891	[a]
3a. In [the Pilot system], it was easy to use: - Calendar [1 = Strongly disagree, 5 = Strongly agree]	Student's	1.499	328.0	0.135	
	Mann-Whitney	12303.500		0.083	
4a. How helpful was [the Pilot system] for… Accessing course materials [1 = Not at all helpful, 3 = Very helpful]	Student's	-0.915	557.0	0.361	
	Mann-Whitney	33623.500		0.360	
4a. How helpful was [the Pilot system] for... Studying for exams [1 = Not at all helpful, 3 = Very helpful]	Student's	0.666	373.0	0.506	
	Mann-Whitney	14797.500		0.505	
4a. How helpful was [the Pilot system] for... Submitting homework and assignments [1 = Not at all helpful, 3 = Very helpful]	Student's	0.188	446.0	0.851	
	Mann-Whitney	21825.000		0.851	

[8] The Mann-Whitney test is more conservative and in cases like this where that was significant but the t-test wasn't I think it's fine to make a conclusion consistent with the Mann-Whitney result.

4a. How helpful was [the Pilot system] for... Checking my progress in the course [1 = Not at all helpful, 3 = Very helpful]	Student's	0.533	497.0	0.594	
	Mann-Whitney	26465.000		0.594	
4a. How helpful was [the Pilot system] for... Communicating with my instructor(s) [1 = Not at all helpful, 3 = Very helpful]	Student's	0.293	299.0	0.770	
	Mann-Whitney	10132.000		0.770	
4a. How helpful was [the Pilot system] for... Communicating with other students in the course [1 = Not at all helpful, 3 = Very helpful]	Student's	-0.709	243.0	0.479	
	Mann-Whitney	6374.500		0.479	
4a. How helpful was [the Pilot system] for... Monitoring the due dates for assignments and course activities [1 = Not at all helpful, 3 = Very helpful]	Student's	-1.066	519.0	0.287	[a]
	Mann-Whitney	28246.500		0.287	[a]
4a. How helpful was [the Pilot system] for... Reviewing feedback on homework and assignments [1 = Not at all helpful, 3 = Very helpful]	Student's	1.573	413.0	0.117	[a]
	Mann-Whitney	17991.500		0.117	[a]
7a. Agree or disagree: I would like [the Pilot system] to be the standard LMS for my courses at Washington University. [1 = Strongly disagree, 5 = Strongly agree]	Student's	5.044	584.0	< .001	
	Mann-Whitney	48575.500		< .001	
8a. How often did you experience any technical difficulties using [the Pilot system] (i.e., login issues, system outages, etc.)?	Student's	-1.935[9]	584.0	0.053	
	Mann-Whitney	34352.000		0.014	
9. How many semesters (including this one) have you used Blackboard?	Student's	0.705	583.0	0.481	
	Mann-Whitney	38802.500		0.682	
10. LMS Preference: Accessing course materials [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	4.020	531.0	< .001	
	Mann-Whitney	37378.000		< .001	
10. LMS Preference: Studying for exams [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	4.699	531.0	< .001	

[9] Negative t statistics indicate that Schoology received a rating with a higher numeric value than Canvas. In this case that indicates more technical difficulties with Schoology.

	Mann-Whitney	38442.500		< .001	
10. LMS Preference: Submitting assignments [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	3.508	531.0	< .001	
	Mann-Whitney	36706.000		< .001	
10. LMS Preference: Checking my progress in the course [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	4.373	531.0	< .001	
	Mann-Whitney	38041.500		< .001	
10. LMS Preference: Communicating with my instructor(s) [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	2.692	531.0	0.007	[a]
	Mann-Whitney	35277.000		0.007	[a]
10. LMS Preference: Communicating with other students in the course [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	3.796	531.0	< .001	[a]
	Mann-Whitney	36668.000		< .001	[a]
10. LMS Preference: Monitoring the due dates for assignments and course activities [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	4.386	531.0	< .001	[a]
	Mann-Whitney	37732.500		< .001	[a]
10. LMS Preference: Reviewing feedback on homework and assignments [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Student's	5.457	531.0	< .001	
	Mann-Whitney	39493.500		< .001	
11. Compared to Blackboard, [the Pilot system] is... - easier to learn [1 = Strongly disagree, 5 = Strongly agree]	Student's	2.405	531.0	0.017	
	Mann-Whitney	35562.000		0.007	
11. Compared to Blackboard, [the Pilot system] is... - easier to use [1 = Strongly disagree, 5 = Strongly agree]	Student's	2.295	531.0	0.022	
	Mann-Whitney	35604.500		0.007	
11. Compared to Blackboard, [the Pilot system] is... - more effective for my learning [1 = Strongly disagree, 5 = Strongly agree]	Student's	3.373	531.0	< .001	[a]
	Mann-Whitney	37113.000		< .001	[a]
11. Compared to Blackboard, [the Pilot system] is... - more valuable to my course experience [1 = Strongly disagree, 5 = Strongly agree]	Student's	3.068	531.0	0.002	[a]
	Mann-Whitney	36642.000		< .001	[a]

[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Descriptives

	Group	N	Mean	SD	SE
2. On average, how many hours per week have you spent using [the Pilot system] for your course this semester? (Response ranges converted to nearest hours.)	Canvas	402	3.259	3.230	0.161
	Schoology	208	2.243	2.266	0.157
3a. In [the Pilot system], it was easy to use: - Announcements/Updates [1 = Strongly disagree, 5 = Strongly agree]	Canvas	378	4.106	1.119	0.058
	Schoology	168	3.929	1.202	0.093
3a. In [the Pilot system], it was easy to use: - Activity feed [1 = Strongly disagree, 5 = Strongly agree]	Canvas	324	3.830	1.239	0.069
	Schoology	141	3.745	1.186	0.100
3a. In [the Pilot system], it was easy to use: - Assignments [1 = Strongly disagree, 5 = Strongly agree]	Canvas	389	4.193	1.174	0.060
	Schoology	187	3.995	1.203	0.088
3a. In [the Pilot system], it was easy to use: - Discussions [1 = Strongly disagree, 5 = Strongly agree]	Canvas	270	3.996	1.165	0.071
	Schoology	124	3.790	1.164	0.104
3a. In [the Pilot system], it was easy to use: - Syllabus [1 = Strongly disagree, 5 = Strongly agree]	Canvas	366	4.298	1.091	0.057
	Schoology	158	4.006	1.192	0.095
3a. In [the Pilot system], it was easy to use: - Tests/Quizzes [1 = Strongly disagree, 5 = Strongly agree]	Canvas	258	4.147	1.151	0.072
	Schoology	89	3.921	1.160	0.123
3a. In [the Pilot system], it was easy to use: - Files [1 = Strongly disagree, 5 = Strongly agree]	Canvas	351	4.131	1.254	0.067
	Schoology	160	3.987	1.223	0.097
3a. In [the Pilot system], it was easy to use: - Modules/Folders [1 = Strongly disagree, 5 = Strongly agree]	Canvas	352	4.148	1.215	0.065
	Schoology	148	4.122	1.142	0.094
3a. In [the Pilot system], it was easy to use: - Collaborations [1 = Strongly disagree, 5 = Strongly agree]	Canvas	181	3.680	1.320	0.098

	Schoology	74	3.676	1.124	0.131
3a. In [the Pilot system], it was easy to use: - Inbox/Messages [1 = Strongly disagree, 5 = Strongly agree]	Canvas	253	3.913	1.192	0.075
	Schoology	122	3.730	1.233	0.112
3a. In [the Pilot system], it was easy to use: - Chat [1 = Strongly disagree, 5 = Strongly agree]	Canvas	133	3.444	1.293	0.112
	Schoology	59	3.458	1.056	0.137
3a. In [the Pilot system], it was easy to use: - Calendar [1 = Strongly disagree, 5 = Strongly agree]	Canvas	237	3.916	1.249	0.081
	Schoology	93	3.688	1.216	0.126
4a. How helpful was [the Pilot system] for... Accessing course materials [1 = Not at all helpful, 3 = Very helpful]	Canvas	378	1.950	0.219	0.011
	Schoology	181	1.967	0.180	0.013
4a. How helpful was [the Pilot system] for... Studying for exams [1 = Not at all helpful, 3 = Very helpful]	Canvas	267	1.869	0.338	0.021
	Schoology	108	1.843	0.366	0.035
4a. How helpful was [the Pilot system] for ... Submitting homework and assignments [1 = Not at all helpful, 3 = Very helpful]	Canvas	306	1.941	0.236	0.013
	Schoology	142	1.937	0.245	0.021
4a. How helpful was [the Pilot system] for... Checking my progress in the course [1 = Not at all helpful, 3 = Very helpful]	Canvas	350	1.914	0.280	0.015
	Schoology	149	1.899	0.302	0.025
4a. How helpful was [the Pilot system] for... Communicating with my instructor(s) [1 = Not at all helpful, 3 = Very helpful]	Canvas	202	1.842	0.366	0.026
	Schoology	99	1.828	0.379	0.038
4a. How helpful was [the Pilot system] for... Communicating with other students in the course [1 = Not at all helpful, 3 = Very helpful]	Canvas	164	1.762	0.427	0.033
	Schoology	81	1.802	0.401	0.045
4a. How helpful was [the Pilot system] for... Monitoring the due dates for assignments and course activities [1 = Not at all helpful, 3 = Very helpful]	Canvas	360	1.925	0.264	0.014
	Schoology	161	1.950	0.218	0.017

4a. How helpful was [the Pilot system] for... Reviewing feedback on homework and assignments [1 = Not at all helpful, 3 = Very helpful]	Canvas	302	1.904	0.295	0.017
	Schoology	113	1.850	0.359	0.034
7a. Agree or disagree: I would like [the Pilot system] to be the standard LMS for my courses at Washington University. [1 = Strongly disagree, 5 = Strongly agree]	Canvas	389	3.743	1.314	0.067
	Schoology	197	3.173	1.250	0.089
8a. How often did you experience any technical difficulties using [the Pilot system] (i.e., login issues, system outages, etc.)? (Response categories converted to nearest n.)	Canvas	389	0.748	1.559	0.079
	Schoology	197	1.030	1.868	0.133
9. How many semesters (including this one) have you used Blackboard?	Canvas	389	1.545	0.627	0.032
	Schoology	196	1.505	0.683	0.049
10. LMS Preference: Accessing course materials [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.148	0.905	0.048
	Schoology	174	-0.184	0.867	0.066
10. LMS Preference: Studying for exams [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.131	0.760	0.040
	Schoology	174	-0.190	0.692	0.052
10. LMS Preference: Submitting homework and assignments [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.214	0.840	0.044
	Schoology	174	-0.057	0.838	0.064
10. LMS Preference: Checking my progress in the course [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.426	0.801	0.042
	Schoology	174	0.098	0.837	0.063
10. LMS Preference: Communicating with my instructor(s) [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.220	0.655	0.035
	Schoology	174	0.057	0.651	0.049
10. LMS Preference: Communicating with other students in the course [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.214	0.617	0.033
	Schoology	174	-0.006	0.650	0.049

10. LMS Preference: Monitoring the due dates for assignments and course activities [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.479	0.743	0.039
	Schoology	174	0.167	0.826	0.063
10. LMS Preference: Reviewing feedback on homework and assignments [-1 = Blackboard, 0 = No preference, 1 = Pilot LMS]	Canvas	359	0.334	0.777	0.041
	Schoology	174	-0.063	0.813	0.062
11. Compared to Blackboard, [the Pilot system] is... - easier to learn [1 = Strongly disagree, 5 = Strongly agree]	Canvas	359	3.671	1.174	0.062
	Schoology	174	3.414	1.128	0.086
11. Compared to Blackboard, [the Pilot system] is... - easier to use [1 = Strongly disagree, 5 = Strongly agree]	Canvas	359	3.716	1.256	0.066
	Schoology	174	3.454	1.190	0.090
11. Compared to Blackboard, [the Pilot system] is... - more effective for my learning [1 = Strongly disagree, 5 = Strongly agree]	Canvas	359	3.521	1.153	0.061
	Schoology	174	3.172	1.045	0.079
11. Compared to Blackboard, [the Pilot system] is... - more valuable to my course experience [1 = Strongly disagree, 5 = Strongly agree]	Canvas	359	3.526	1.186	0.063
	Schoology	174	3.201	1.064	0.081

Appendix F. List of LMS Use Cases

CASE NO.	USER ROLE	CASE CATEGORY	USE CASE
1	Sys Admin	Testing/Support	I need to set up a fake course for testing purposes.
2	Sys Admin	Testing/Support	I need to set up fake users with different roles for testing purposes.
3	Sys Admin	Testing/Support	I need to assign a user as teacher of my fakes course.
4	Sys Admin	Testing/Support	I need to enroll students and T.A.s in my course
5	Sys Admin	Testing/Support	I need to emulate user accounts with different roles for testing/support.
6	Instructor	Assessments	I need a way to upload/import quizzes/exams.
7	Instructor	Assessments	I need an easy and flexible tool for creating quizzes and exams.
8	Instructor	Assessments	I want my scheduled quiz/exam to automatically appear on the course calendar.
9	Instructor	Assignments	I need to post an assignment for my students.
10	Instructor	Assignments	I need to save my default choices for how an assignment should be graded.
11	Instructor	Calendar	I need an easy and flexible tool for creating a class calendar/schedule.
12	Instructor	Communication	I need to create a survey for my students to complete.
13	Instructor	Content	I need a flexible and easy way to post and organize course materials in to folders/groups.
14	Instructor	Content	I need a way to see exactly what my students are seeing.
15	Instructor	Content	I need to be able to include formulas/equations in my course content.
16	Instructor	Content	I need to be able to use HTML to markup my course content.
17	Instructor	Content	I need to embed a video for my students to watch.
18	Instructor	Content	I need to post a wiki article/blog entry for my students to read.
19	Instructor	Content	I need to post the course syllabus.
20	Instructor	Content	I need to replace an existing document with a new version.
21	Instructor	Content	I need to schedule a time/date when a folder/group of items will be available to the students in my course.
22	Instructor	Content	I need to schedule a time/date when a posted document will be available to the students in my course.
23	Instructor	Content	I need to share/embed audio files for my students.
24	Instructor	Content	I need tools/features to help me coordinate with my TAs.
25	Instructor	Content	I want my scheduled assignments to automatically appear on the course calendar.
26	Instructor	Content	I would like to drag and drop documents into the appropriate locations within my course.
27	Instructor	Content	Showing and hiding content from students should be easy and fast.
28	Instructor	Course	I need some visual indication which tells me whether the course is open to students or not.
29	Instructor	Portfolios	I need a place for my students to post an online portfolio.
30	Instructor	Third Party Tools	I need the LMS to integrate with ARES (documents).

31	Instructor	Third Party Tools	I need the LMS to integrate with Bitbucket.
32	Instructor	Third Party Tools	I need the LMS to integrate with Box.
33	Instructor	Third Party Tools	I need the LMS to integrate with McGraw-Hill Connect.
34	Instructor	Third Party Tools	I need the LMS to integrate with Microsoft One Drive.
35	Instructor	Third Party Tools	I need the LMS to integrate with Piazza web pages.
36	Instructor	Third Party Tools	I need the LMS to integrate with TopHat (attendance and questions/quizzes)
37	Instructor	Third Party Tools	I would like the LMS to integrate with Kaltura.
38	Instructor	Training/Help	I would like hover tips on the various tools and options available on the screen.
39	Instructor	Announcements	I need to embed a video in an announcement to my students in this course.
40	Instructor	Announcements	I need to embed HTML in my course announcements.
41	Instructor	Announcements	I need to make an announcement to my students in this course.
42	Instructor	Announcements	I need to see which students did or did not receive notification of a course announcement.
43	Instructor	Announcements	I need to see which students did or did not receive notification of an assignment.
44	Instructor	Announcements	I need to see which students did or did not receive notification of a quiz/exam.
45	Instructor	Assessments	I need an easy and flexible tool for grading quizzes and exams.
46	TA	Assessments	I need to grade a quiz for the students in the course.
47	TA	Assessments	I need to post a quiz for the students in the course.
48	Instructor	Assignments	I need a way to batch download attached assignment submissions.
49	Instructor	Assignments	I need to be sure that the LMS will not rename an assignment submission when I download it.
50	Instructor	Assignments	I need to grade a group assignment for my students.
51	Instructor	Assignments	I need to grade an assignment for my students.
52	Instructor	Assignments	I need to mark up/comment on an assignment for my students.
53	Instructor	Assignments	I need to post a group assignment for my students.
54	Student	Assignments	I need an easy way to see what course materials I've reviewed and assignments that I've completed versus what remains for me to complete.
55	TA	Assignments	I need to grade an assignment for the students.
56	Instructor	Attendance	I need to record attendance for each class session.
57	Instructor	Calendar	I need to notify students of changes to the class calendar/schedule.
58	Student	Calendar	I need to find out when my assignment is due.
59	Student	Calendar	I need to find out when the next quiz/exam is.
60	Instructor	Communication	I need to compile survey results into a report with graphs.
61	Instructor	Communication	I need to email a specific student.
62	Instructor	Communication	I need to email each student their final grade.
63	Instructor	Communication	I need to email each student their grade on a specific assignment/assessment.
64	Instructor	Communication	I need to email each student their midterm grade.
65	Instructor	Communication	I need to email the entire class.
66	Instructor	Communication	I need to have a private chat with one student.

67	Instructor	Communication	I need to refer back to emails that I sent to students during the course.
68	Student	Communication	I need to receive a notification email when a new assignment or quiz is uploaded.
69	Instructor	Content	I need each student to send me a document.
70	Instructor	Content	I need to know which students did and did not watch the video I posted.
71	Instructor	Content	I need to know which students did or did not read the wiki article/blog entry I posted.
72	Instructor	Content	I need to share a document with the students in my course.
73	Instructor	Discussion	I need a way to anonymize my students during a guided discussion. Only I should be able to see who they are.
74	Instructor	Discussion	I need to facilitate an online student discussion.
75	Instructor	Discussion	I need to set up private group discussions with specific groups.
76	Instructor	Grades	I need a way to import grades from a CSV file.
77	Instructor	Grades	I need a way to mass edit all of the grades in a column (e.g. select column, paste).
78	Instructor	Grades	I need an easy and flexible reporting tool for monitoring student progress (grades, attendance).
79	Instructor	Grades	I need an easy way to monitor student performance in real time (who is currently failing?).
80	Instructor	Grades	I need the ability to easily move the columns in the gradebook and for the system to keep the order I select the next time I log in.
81	Instructor	Grades	I need the gradebook feature to be simple.
82	Instructor	Grades	I need to use a custom formula to calculate student grades.
83	Instructor	Overall	I should be able to remove (or hide) interface elements and features I don't intend to use.
84	Instructor	Overall	The system needs to load quickly.
85	Instructor	Platform	I use an iPad to access my course.
86	Instructor	Platform	I use Safari on Mac.
87	Instructor	Platform	Interface elements need to be responsive to different screen sizes.
88	Instructor	Portfolios	I need to grade my students' online portfolios.
89	Student	Portfolios	I need to set up an online portfolio for my class
90	Instructor	Real Time	I need real-time white board functionality.
91	Instructor	Real Time	I need to have an online chat (text) with my entire class.
92	Instructor	Real Time	I need to have an online session (video) with my entire class.
93	Instructor	Real Time	I need to hold a lecture online and record it to share with students who can't attend.
94	Instructor	Real Time	I need to hold a virtual class online (video, audio, text/chat).
95	Instructor	Security	I need to provide an secure and private environment for my students (no linking to social media)
96	Instructor	Third Party Tools	I need to check all submitted assignments for plagiarism.

Appendix G. LMS Review Committee Members

1. Jason Crandall, Co-chair, School of Engineering and Applied Science
2. Emily Thompson, Co-chair, Olin Business School
3. Richard Abrams, Arts and Sciences
4. Cory Brant, School of Medicine
5. Amanda Carey, University College
6. Jason Crustals, School of Medicine
7. Carolyn Dufault, School of Medicine
8. Jill Fechtman, Registrar's Office
9. Beth Fisher, Teaching Center
10. Chris Freeland, University Libraries (former member)
11. Jenine Harris, School of Social Work (former member)
12. Sherry Holmes, Student Technology Services
13. Pat Matthews, University College
14. Lindsay Meador, Teaching Center
15. Barb Norton, School of Medicine
16. Bill Siever, School of Engineering and Applied Science
17. Rooji Sugathan, WashU IT
18. Ashby Tyler, School of Social Work
19. Gail Walters, Olin Library

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Appendix H. LMS Evaluation Program Faculty Participants

1. Amanda Carey, Arts & Sciences
2. Ari Stern, Arts & Sciences
3. Betsy Foy, University College
4. Bettina Drake, Medicine
5. Bill Siever, Engineering & Applied Science
6. Cheryl Caldwell, Medicine
7. Dedric Carter, Business
8. Dorothy Petersen, Arts & Sciences
9. Doug Shook, Engineering & Applied Science
10. Emily Boyd, Engineering & Applied Science
11. Erika Conti, Arts & Sciences
12. Graham Colditz, Medicine
13. Gregory Holtzman, Medicine
14. Grizelda McClelland, Arts & Sciences
15. Heather Hayes, Medicine
16. James Bernhardt, Social Work & Public Health
17. James Jackson Potter, Engineering & Applied Science
18. Jamie Sawhill, Business
19. Janie Brennan, Engineering & Applied Science
20. Jeffrey Heaton, Engineering Continuing Studies
21. Jeremy Caddel, Arts & Sciences
22. Jessica Hutchins, Arts & Sciences
23. Jessica Levy, Social Work & Public Health
24. John Horn, Business
25. Joseph Jez, Arts & Sciences
26. Joshua Landman, Engineering & Applied Science
27. Justin Perryman, University College
28. Kasey Grady, Arts & Sciences
29. Katharine Flores, Engineering & Applied Science
30. Keith Beutler, University College
31. Kennedy Maranga, University College

32. Kim Johnson, Social Work & Public Health
33. Kraig Hufstedler, Engineering & Applied Science
34. Lauren Milton, Medicine
35. Lisa Olenski, Engineering & Applied Science
36. Lorien Carter, Social Work & Public Health
37. Lynnea Brumbaugh, Engineering & Applied Science
38. Mary Malast, Engineering & Applied Science
39. Michael Wysession, Arts & Sciences
40. Michele Augustin, Arts & Sciences
41. Nancy Berg, Arts & Sciences
42. Pascal Boyer, Arts & Sciences
43. Patricia McGee, Medicine
44. Patricia Widder, Engineering & Applied Science
45. Rafia Zafar, Arts & Sciences
46. Richard Abrams, Arts & Sciences
47. Rick Kacenski, Architecture
48. Robert Salter, University College
49. Ruth Clark, Medicine
50. Sara Estle, University College
51. Shaun Sellers, Engineering & Applied Science
52. Stefanie Boese, Arts & Sciences
53. Thomas Rodebaugh, Arts & Sciences
54. Trevor Sangrey, Arts & Sciences
55. Tsitsi Madziwa-Nussinov, Engineering & Applied Science