Canvas UX Think Aloud Observations Report
Results from research on participants’ navigation experiences in online redesigned Canvas courses

Suggested Citation
Canvas UX Think Aloud Observations Report

Executive Summary
As of FA17, all Penn State courses will be offered in the Canvas learning management system (LMS). During the transition from ANGEL, the previous LMS, to Canvas, the Penn State Canvas UX research team has conducted multiple studies using user experience (UX) methodologies. The goal of this research effort is to understand users’ preferences and practices within Canvas in order to improve course designs from a UX perspective and contribute positively to the teaching and learning experience. This report specifically discusses the Think Aloud Observations study.

Study Context & Purpose
The transition necessitated moving online courses from ANGEL to Canvas. For many, this was used as an opportunity to improve and update course designs to better integrate with the new LMS. This required multiple design decisions such as how to manage external course content, what the home page should be within the LMS, which menu items should be enabled, and how the syllabus should be configured. The purpose of the Think Aloud Observations study was to (a) provide feedback for the design units that participated in the study regarding the usability of their designs, and (b) identify general UX principles that might apply across Penn State online courses in Canvas.

Study Design
Nineteen Penn State students were observed individually as they performed common course tasks while verbalizing their thought processes (i.e. thinking aloud). The learners’ reflections and actual behaviors were then analyzed thematically in order to identify perceptions of Canvas, navigation tendencies and preferences, and non-intuitive design elements that interfered with seamless navigation.

Study Findings
Based on the analysis of the think aloud observations, it was found that overall,

1. Students like the Canvas LMS and find it relatively easy to use.
2. Students orient to their courses differently than educators and designers.
3. Students rely heavily on Modules but have individualized navigation practices.
4. Students can be confused by terminology discrepancies and ambiguities.
5. Students can be confused by multiple interfaces within a course.
6. Students can be confused by inconsistent content organization within a course.
7. Students can be confused by different designs across courses.
8. Students can be confused by some design features inherent to Canvas.

Report Organization
This report summarizes the study methods; students’ perceptions of, orientation to, and navigation within Canvas; common points of confusion; practical implications; and the study limitations. Additional information about the study is included in the appendices.
Acknowledgements

The report is the result of a highly collaborative University research effort initiated in the College of Information Sciences and Technology by Amy Garbrick and Ronda Reid. The College of IST, Teaching and Learning with Technology, the World Campus, the College of the Liberal Arts, and the College of Earth and Mineral Sciences have all provided administrative, financial, travel, and/or staff support.

Additionally the author wishes to thank the following individuals and departments for participating in developing the study framework, participating in the data collection, and/or facilitating the reporting of the findings: Stevie Rocco and Maggie Frederick of the John A. Dutton e-Education Institute for the College of Earth and Mineral Sciences, Cathy Holsing, Jennifer Gray, and Tracy Wallace of the Filippelli Institute for e-Education and Outreach for the College of the Liberal Arts, Mike Brooks and Jana Hitchcock of the World Campus Learning Design unit, and Dr. Vicki Williams and Nai-Fen Su of Teaching and Learning with Technology. Lastly, we would like to thank the students who came to the University Park campus and participated in this research.

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This study is part of a larger Penn State research effort—the Canvas UX Research team—comprised of Amy Garbrick, Ronda Reid, Dr. Andrea Gregg, and Dr. Vicki Williams. Another major component of this research team is the Learner Preferences Survey and a key finding from that study, that was confirmed by the Think Aloud Observations study, is that learners generally have an efficiency approach to course navigation (Reid, Gregg, Williams, Garbrick, 2016).

For additional information about the various efforts of the Penn State Canvas UX Research team please visit https://sites.psu.edu/uxcanvas/
Study Methods

User Experience (UX) Framework
A primary goal of UX research is studying how users *actually* use something as opposed to how designers intend it to be used. The following image demonstrates this distinction.

UX research has been used within the field of human-computer interaction (Hassenzahl & Tractinsky, 2006) but has not been as widely applied in the e-learning context (Fisher & Wright, 2010). While online learning environments seem to be a logical focus for UX research, given the primacy of the web interface to the online learners’ experiences, designing for e-learning is distinct from designing for e-commerce. Design for online learning involves the consideration of learning outcomes, levels of learning, demonstrations of learning, instructional approaches, and alignment between objectives, content, and assessment (Notess, 2001). As many educators can attest, student satisfaction is not the primary goal of an online course, student learning is. At the same time, challenges inherent to the learning itself should be viewed differently than challenges resulting from non-intuitive interfaces. The research discussed here focused on UX, rather than pedagogical, elements of course design. The ultimate emphasis was on understanding what might be getting in the way of learners’ seamless navigation of their online courses.

Think Aloud Methods
Think aloud observations are a common UX method used to evaluate designs and were used in this study to better understand what occurs for learners while they are navigating their online course interfaces. The method involves asking participants to complete a set of tasks while verbalizing their thought processes (i.e., thinking aloud). This is done in order to reveal “the assumptions, inferences, misconceptions and problems that the users face while solving problems or performing tasks” (Benbunan-Fich, 2001, p. 153). This type of research can both inform design decisions and indicate where more scaffolding is needed.
**Study Evolution**

The Learning Design unit within the College of Information Sciences and Technology (IST) initially tested the methods for this research by running a pilot with a group of IST interns. The study was then submitted for IRB approval and after that five learners from the online IST program participated in the IRB study (#4365). After learning about the Think Aloud Observations study, three additional design units joined the effort: the John A. Dutton e-Education Institute for the College of Earth and Mineral Sciences (EMS), the Filippelli Institute for e-Education and Outreach for the College of the Liberal Arts (LA), and the World Campus Learning Design unit (WCLD).

**Research Focus**

The purpose of this study was two-fold. Each design unit wanted to evaluate the UX components of their online course design with actual Penn State student participants in order to identify areas for design improvement. Additionally, the research group wanted to identify any general UX principles that might apply across Penn State online courses in Canvas. The unique findings specific to individual designs have already been presented to each participating design unit. This report instead emphasizes the UX trends that emerged across multiple designs.

**Study Participants**

Each design unit recruited participants from a group of students who had taken online courses developed by their unit (e.g., LA recruited from a population of World Campus LA majors). The target was five participants based on usability best practices (Nielsen, 2000). In total, 19 participants completed this study. They were each incentivized with a $50 gift card on completing the think aloud observation. The following table, ordered by age range, indicates gender, undergraduate (U) and graduate (G) status, major, and their LMS experience at the point of participating in the study.

<table>
<thead>
<tr>
<th>Age: 18-23</th>
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<th>Age: 40-40</th>
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<tr>
<td>Richard* (M)</td>
<td>Dean* (M)</td>
<td>Fiona* (F)</td>
<td>Peter* (M)</td>
<td>Gary* (M)</td>
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<tr>
<td>G: LDT ANGEL &amp; Canvas</td>
<td>UG: IST ANGEL &amp; Canvas</td>
<td>UG: IST ANGEL &amp; Canvas</td>
<td>UG: Sec &amp; Risk ANGEL only</td>
<td>Post-Bac: GIS Canvas only</td>
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<tr>
<td>Maggie* (F)</td>
<td>Susan* (F)</td>
<td>Danny* (M)</td>
<td>James* (M)</td>
<td>Alan* (M)</td>
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<td>UG: Crim Justice ANGEL &amp; Canvas</td>
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<td>UG: Sec &amp; Risk ANGEL only</td>
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<tr>
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<td>Perran* (F)</td>
<td>Emma* (F)</td>
<td>John* (M)</td>
<td>Karen* (F)</td>
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</table>

*Pseudonyms
Data Collection

While each unit used their own design and recruited their own participants, the study was conducted such that there would be consistency across the data collection. Each design unit developed a set of tasks for the participants to complete based on a consistent set of core questions. (Please see Appendix A for the task protocols used for the data collection.) Additionally, all of the facilitators, excepting those from IST who had already conducted their testing, received the same training in how to conduct a think aloud observation.

The following steps were used in each of the 19 observations:
1. Each room was set up to audio, video, and screen capture the full observation.
2. The same graduate assistant helped coordinate all of the data collection and ensured consistency in setup and technology.
3. The participant was welcomed and then informed of the study protocol.
4. The participant was asked to sign the informed consent form.
5. The facilitator demonstrated to the participant how to think aloud while completing tasks.
6. The participant was asked to work through each task, to think aloud while doing so, to rank the task difficulty, and to provide any additional feedback.
7. While the participant was working on the tasks, the facilitator did not offer any help or suggestions.
8. Once the set of structured tasks was completed, the facilitator asked a set of open-ended questions.
9. When the observation was complete, the facilitator immediately captured his or her observations in a set of facilitator notes that later became part of the data analyzed.

The image below indicates how the data collection rooms were set up for all of the think aloud observations.
Data Analysis

The primary research focus of this study was to better understand the participants’ frames of reference, navigation behaviors, and points of confusion and frustration. Anything that seemed to get in the way of intuitive navigation for learners was noted. We understood the UX of a course design to be intuitive when “users [could] focus on a task at hand without stopping even for a second” (Laja, 2012), when “people just [knew] what to do and they [didn’t] have to go through any training to get there” (as cited in Butko & Molin, 2012), and when users could “concentrate on the task that needs to be done and not on the design itself” (Butko & Molin, 2012). In order to identify patterns in the learners’ actual behaviors and experiences, two researchers conducted the data analysis.

One researcher explicated all of the steps for each task for each participant and coded for time, effectiveness, efficiency, satisfaction, and learnability. Both researchers collectively developed this scheme for coding the data. The two researchers then separately and collectively reviewed multiple times the transcripts, videos, difficulty rankings, open-ended participant comments, and facilitator notes. This data were then analyzed thematically according to the research focus (Braun & Clarke, 2006; Clarke & Braun, 2014; Creswell, 2012; Saldaña, 2012). By way of transparency, it should be noted that one of the researchers was also a participant in the study before she was aware that she would be working on the analysis of the data. This issue was discussed in depth and it was decided that her data would remain in the study as she was not aware of her later role at the time that she was a participant. Additionally, since both researchers worked individually and collaboratively with all of the data, over an extended period of time, ultimately discussing and resolving different perspectives, and developing mutually agreed on codes, analysis schemes, and themes it was decided that her data was still a useful contribution to the research focus of the study.

Please see Appendix B for examples of the data elements that were analyzed. For a full copy of the steps explicated for each participant for each task, please contact the report author.
**Findings**

This section discusses each of the findings from this study that were identified through the thematic analysis of the data.

**Finding 1: Students like the Canvas LMS and find it relatively easy to use.**

There was consistent feedback from participants that Canvas was intuitive, easy to use, and an improvement over ANGEL. Students indicated this sentiment as they were completing specified tasks as well as in the open-ended questions asked at the end of each observation. Many of the participants had never experienced Canvas before but were able to navigate quite easily and quickly understood the underlying logic of the system. Students were not asked to compare their experiences in Canvas to their experiences in ANGEL but they often did so unprompted. Some examples of their positive affect toward the system include the following:

"Well, right now it's much easier than the current system [ANGEL] ... So far this one seems smooth. It's much easier, flows better." (Peter)

"ANGEL is very outdated, and this UI feels much more fluid and user-accessible." (Stephen)

"It's pretty much straightforward. It's pretty easy to navigate." (Dean)

"After I used the first time, it was so easy, very easy to learn...it took just ten minutes or less for me to learn this system." (Perran)

"I like Canvas fine... whenever I get somehow dropped into an ANGEL screen, I think it looks hideous. It looks like something from the 1980s." (Gary)

"That's good. I like it. I like Canvas. I'm almost sad that I'm going to be graduating in December." (John)

"Overall, the site is a lot more clean than, say, ANGEL is. It's the only other site I have experience with. Everything makes sense pretty much...It's a pretty clean website...it's pretty easy." (Harry)

"It seemed like most things were fairly quick, especially the modules like here. To get to this level in ANGEL would have been probably four or more clicks...I'm a fan." (Rupert)

"So the modules list is nice. As I mentioned, I used the ability to collapse modules to keep the most current one at the top more or less and hide ones that have past." (James)

**Finding 2: Students orient to their courses differently than educators and designers.**

Learners—much like web users generally—tend to navigate from an efficiency framework.

"When people navigate through software or a Web site, seeking information or a specific function, they don’t read carefully. They scan screens quickly and superficially for items that seem related to their goal. They don’t simply ignore items unrelated to their goals; they often don’t even notice them." (Johnson, 2014)

This pragmatic approach with a focus on efficiency was also supported by the User Preferences Survey (IRB #4406) which found that students generally preferred the most direct route to get to their course content, links that helped them quickly find assignments...
and grades, and a syllabus organization that emphasized the course schedule and what was specifically required of them (Reid et al., 2016).

At various points throughout the study, students’ actual navigation behaviors were shown to be in contrast to the navigation behaviors intended by the course designers. As one example, Emma described that in attempting to complete her tasks, she tended to find much of the carefully designed screen to be “clutter.”

“Like I said, I feel like I do a lot of clicking back and forth, but I think that's just me. I don't know a lot about technology, so I end up checking all these different tabs and stuff... I don’t know what that course button does. Not really sure what dashboard is either. And I don’t use any of these things over here. This, to me, is just kind of like... I don't know. It's just clutter. I don't use any of this stuff. I guess there's a lot of things I have no idea what it is because I've never used it.” (Emma)

Another example of the different frameworks that learners can bring to their navigation is the distinction between the terms unit and lesson. Educators will often use unit as a larger organizing container in which lessons might be found. However, when learners were navigating and came upon both terms used in such a way, they did not make any logical or organizational connection between unit as a container for lesson. Instead they found the use of both terms to be confusing.

“It’s a little confusing because I see unit three but then there’s lesson five, lesson six. Lesson five activity, lesson six activity, lesson seven activity” (Alan)
“Actually unit two versus lesson three is all about-- its a little confusing because they’re not-- they're in the same grouping, but they're...” (David)
“I’m in "modules" and I’m just going to Unit Three-- no that’s Lesson Five. What was Lesson Three? Lesson Three is Unit Two, content is right there.” (Gary)

**Finding 3: Students rely heavily on Modules but have individualized navigation practices.**

**Modules.**
The Learner Preferences Survey found that when given the option of four landing pages in Canvas, learners prefer to land on the Modules page (Reid et al., 2016). This was supported by the think aloud observations in that learners heavily utilized the modules page for their work. This is in large part due to the design of Canvas and the way in which many different items (quizzes, content, discussions) are housed in Modules. In navigating Canvas, students quickly realized that much of their course could be accessed through Modules. This was true even among students for whom it was their first time in Canvas.

"I've learned that most everything is now under a module." (Danny)
"To me, I find that very logical. It seems like everything's there [modules]. So, I feel like even if I don't immediately know where something is, at least I know if I could get there [to modules], I can find it.” (Gary)
"Once you understand that modules is pretty much where you're going to go for everything, it ends up being a whole lot easier finding a lot of these." (Dean)
"Similarly, I’d go back first to the Modules... I use Modules the most frequent, I think, because it's already very good.” (Lien)
"I’ll probably use modules again." (Perran)
"I knew they would be in modules. I knew they’d be in order. I knew I’d be able to find them instantly." (Karen)

**Individualized navigation practices.**
While students tended to rely heavily on Modules, it is also the case that in Canvas there are often multiple ways to accomplish the same task. Accordingly, learners had very individualized approaches to doing so.

**Syllabus, Calendar, To Do**
For some, this involved relying heavily on the Syllabus, Calendar, or To Do list.

“I usually always go to the syllabus first whenever an instructor is sending any announcements or emails, talking about any readings to double check what they list there, if they do list them.” (Fiona)

"For something like that I would expect it to be in the calendar...” (Dean)

"I’d look in the calendar for my upcoming workload and I’d look at the agenda based off of today's dates." (Danny)

“Using the calendar and the “to do” list on the right is really great because it lists everything right there. “(James)

“How would I accomplish this? I’m looking at the screen. I look over the to-do.” (John)

Some participants actually avoided features in Canvas that others found quite useful, such as Calendar, because of past experiences with how calendars functioned (or were at least used) in ANGEL.

This tendency is consistent with Finding 2 in terms of learners orienting differently than designers and instructors. Additionally, it is supported by the literature which suggests that learners’ interaction with systems is informed by a number of factors including personal characteristics (e.g. age, cognitive style, skills), system experience (e.g. general knowledge of computers), task experience (e.g. domain knowledge), and application experience (e.g. knowledge of similar applications) (ISO 9241-11, 1998; Shneiderman & Hochheiser, 2001).

**Grades page to manage schedule**
Another example supporting the individualized navigation paths that some learners take is David’s discovery of the Grades page. On accessing the Grades page, he observed that it includes due dates and stated that it would become a page he would rely on to organize his work, much like Syllabus, Calendar, and To Do were for others. This example also speaks again to Finding 2 in that the Grades page was not intended to serve as a course organizing feature but this particular participant found it to serve that function for him.

“So, that was easy because I had found [Grades page] before when I was looking for the due dates, and then it becomes apparent that this page is going to become one of the main pages I’m going to check on a regular basis because of due dates and grades.” (David)
Finding 4: Students can be confused by terminology discrepancies and ambiguities.
One of the major contributing factors to non-intuitive navigation was unclear terminology used to label items throughout the course. It is important to note that the terminology challenges observed in this finding were not inherent to Canvas but were instead in the purview of designers and/or instructors. This has implications for direction writing as well as for the naming of items in the online course itself. There were three ways in which this issue was observed.

Ambiguity around terminology
A first example is the term resources that was used in a task and understood multiple ways by the participants.

"Well I’d say it’s a four [difficulty ranking] and it’s just my reading the question whether it’s a resource within Canvas or a resource for the project itself. So resource for project. So I just put that the resource for the project within Canvas versus using the library page would be dependent on the interpretation of the question or the wording of looking within it." (James)

“I would say that if it’s just going to some search mechanism and finding out about something [resources] that I would do research on for a Capstone Project, then I would say that it’s easy...So, I’m a little confused about that. I would say it’s easy, but what does this have to do with Canvas?” (David)

Similar terms – Different items
Another case of navigation challenges caused by terminology was terms that referred to different items but were named similarly from the learner perspective. This again supports Finding 2 that learners often orient to the online course differently than designers or educators. One example was already provided above wherein students were easily confused when the terms units and lessons were both used to organize content.

In another example, the participants were asked how they would submit their paper for the Fundraising Scenario assignment. The course contained the following two items: “Fundraising Scenario 1 discussion forum” and “Fundraising Scenario 2 dropbox.” There was a discrepancy between how the task was written and the name of actual items in the course. From the designer perspective, the assumption was that the paper should be submitted to the dropbox (hence “Fundraising Scenario 2 dropbox”) since the term dropbox typically refers to a place to submit assignments. The students reading through this task, however, did not naturally distinguish between the “discussion forum” and the “dropbox.”

“[T]he lesson two fundraising scenario assignment, the word assignment seems kind of vague considering there is a discussion forum and an essay. So I don’t really-- I was confused to which one to choose to submit it in.” (Maggie)

“Fundraising Scenario. Fundraising Scenario... Okay, that’s Fundraising Scenario I and Fundraising Scenario II. So I’m not sure which one it is.” (Emma)

Different terms – Same item
Another instance where terminology caused confusion for participants was when different terms were used to refer to the same item throughout the course. At times the difference
was between the wording that was used in the task and what was in the course itself. At other times, within the course itself, the same item was referred to in different ways.

"I think this is the discussion forum. It doesn't actually say discussion forum on it. But it does have a little text box, so I'm going to guess that's what it is...Discussion activity is the same thing as discussion forum. That was a little confusing, but it makes sense to connect those two languages then." (Danny)

"Once I figured ... the L07 being lesson 7, it was fairly easy to find the assignments and more information about them." (Danny)

"I would say grades are easy to find but... Case study. Assignments. Case study, assignments that were recorded. That's slightly different names, so I'm still not sure." (Emma)

"Whenever I was scrolling through the grades, there was nothing about like what your assignment was for which lesson. And plus-- I mean they each have different names. I don't know if it's for different lessons. So that would be very confusing." (Maggie)

Finding 5: Students can be confused by multiple interfaces within a course.
In designing online courses, design units make decisions about where and how to manage course content distinct from course elements such as exams, assignment folders, and discussion forums. Some use external content management systems [CMS] and separate interfaces to house their content. On the one hand, students are able to understand that a course might have multiple interfaces containing different course materials. As David explains:

"So you still have the Canvas side and the [CMS] side, and I guess this would be the ANGEL side and the [CMS] side. So that’s familiar to people who have already used similar things.” (David)

On the other hand, even among students who understand the distinction between the two systems, there can still be confusion about which functions take place where and how the systems do and do not overlap.

"You're still using two separate systems... That’s a lot of the confusion and for a lot of students because you’re kind of in two different worlds, back and forth... to get back to here you got to go through the Canvas link and go back, and then it jumps you at the top end and-- you’re not even within your course anymore, it’s a little odd.” (David)

"There’s something I find confusing about Canvas, sometimes module’s an option up on this bar and now it isn’t." (Gary)

"So I guess it’s a bit confusing to why would [syllabi in both interfaces] have detail in both." (Alan)

"I’m assuming it’ll come later on, but it would be nice if you didn’t have to go out to the course page. If everything would be in Canvas, but that may just be a personal thing." (James)

Finding 6: Students can be confused by disorganized content presentation.
In addition to some of the UX challenges caused by multiple interfaces, students can also struggle when all of the course materials are contained within Canvas but are distributed in a confusing manner. Inconsistency with the presentation of content will naturally be problematic from a UX perspective. Once learners have experienced that content within a
course may not always be organized logically or consistently, they will expend additional energy ensuring that they do not miss anything. Alternatively, when they do not realize that there is content in multiple places, they may miss important things.

"I've actually had this problem a couple times, not, I guess, necessarily with Canvas - I've found that sometimes the assignments are listed, some are listed in the syllabus and some are listed within the course, so I try to cross-reference those... I would still go back and check the modules because sometimes with the specific assignments... they have extra readings in there that aren't always in the syllabus." (Susan)

"I find sometimes, when I was looking for the due time and the assignments of a specific lesson, sometimes I can find part of the information in the Module under each lesson, but sometimes I have also go back to the Course Syllabus to find more....I feel like sometimes it's better to put all the assignments, maybe like due time, and what activity, and the name together in one place... it's better to save us time and make it more clear." (Lien)

"Whenever I'm reading about something I'd like all of the essential information to just be available at a glance instead of somewhere else on a different list." (Richard)

Finding 7: Students can be confused by different designs across courses.
Each learner brings to the online course his or her past online course experiences. When the experience with the design of other courses differs from the design of the current course, it can cause confusion and frustration.

"It is kind of frustrating too when you’re taking multiple classes and your instructors, or whatever, have different naming conventions, and for submitting assignments and different naming conventions..." (Dean)

"I don’t really know what it means by modules so.... Last semester when they said modules they meant a chapter in my online book.” (Emma)

"My History teacher will have a lot of primary documents under a big heading, and also have an actual reading assignment page. And that’s why I was so used to seeing just that on the page, rather than a lot of other text.” (Maggie)

"The calendar was my friend. So, but my calendar for the class [previously] had said what lesson it was. This calendar doesn’t say lesson eight, so I would have to know what week I was going into.” (Karen)

One participant stated an explicit preference for consistency across courses.

"I like the fact that when you come to-- when you're looking right here at the list of the lessons, you sort of know that the first link will be the lesson directions. And that’s good if it’s sort of standard across all the classes because-- at least that’s what I’ve seen so far.” (John)

Finding 8: Students can be confused by some design features inherent to Canvas.
While the focus of this study was primarily on areas that are within instructors’ and designers’ purview, there were also some features built into the Canvas system that caused confusion for participants. These are not elements that instructors and designers can change, but they are mentioned here as they suggest places that additional scaffolding for learners might help. Additionally, Canvas is aware of the Penn State Canvas UX research efforts and the hope is to provide them with the study findings as well.
**People page**
When asked to communicate with their groups within Canvas, many participants attempted to do this through the People link. Once in the People roster, it was very common for them to then click on the hyperlinked name expecting it to send an email.

> “People should list classmates. You just click on somebody to email them? No.” (Rupert)
> “I believe, say, if <student name> was my teammate I could just use this email to contact her. I’m going to try clicking this link [on the People page], see if there’s a direct way to contact her through Canvas. I don’t see that, but I’d rather use email, anyway, to contact her.” (Harry)

The repeated occurrence of users clicking on the hyperlinked name on the People page to send an email might suggest that the way it is currently formatted indicates a different functionality (e.g., sending an email) than is actually there (e.g., pulling up a profile of the person).

**Inbox**
Another place participants went to communicate with their group was the Inbox. This caused some confusion as well.

> “Trying to figure out who’s in my group or trying to figure out what their email addresses are just from the inbox homepage, would be very confusing. I would not know where to go. Maybe it’d be under an assignment, like a lesson or something or maybe the teacher would email us, but it might be hard to send them.” (Maggie)

**Configuring notifications**
Perhaps in part because this is an infrequently done task, when asked how they would set up a notification for course announcements, many participants experienced difficulty, either failing to complete the task or taking significantly longer than they did to complete the other tasks.

> “I'd probably say a five [in difficulty] - it was very hard - considering that my initial reaction was to look under the inbox because that’s where my emails come from. I didn't really think it would be under account.” (Maggie)
> "Now I'm just searching through the rest of the pages because I am not seeing what I'm looking for. All right, I'm kind of stuck here...I've essentially, yeah, given up at this point." (Richard)

Please see the following image for a visual depiction of how much longer comparatively it took learners to configure their notifications when compared to the other tasks.
Help videos
One additional comment that was offered by a participant who used the help videos in order to figure out how to configure notifications was a request for shorter, just-in-time videos.

“What I didn’t like about that was having to watch a video, because a video-- actually, didn’t talk about it till three minutes. Yeah, 3 minutes and 22 seconds. I skimmed through that by clicking around, but I would probably rather have like a little snippet of information of how to set-- just that there’s area for notifications within the profile, without having to go through a video about setting up your profile and then notifications going through another video.” (Fiona)

Global versus local navigation
For some students the Global navigation compared to the Local navigation caused some disorientation. When they selected the Global navigation for things like their Inbox, they did not immediately understand that they had left their individual course and were now in a more global view of all of their courses.
Practical Implications
The following section will briefly highlight some practical implications for design practices specifically pertaining to improving UX as suggested by the study. As discussed previously, the study focused only on UX and not on pedagogy, instructional design quality, or course scalability across multiple sections. Given that online course design is incredibly complex and a product of many factors, the following should be seen as only suggestions to consider, rather than rules, offered based on the findings of this study.

While there may be times where UX principles are sacrificed for pedagogy, course scalability, piloting a new system, or some other reason, wherever possible, it is suggested that you consider the UX implications of your design decisions. When it comes to online learning the course interface is often the face of the university, the campus, the building, the classroom, the instructor, the other students, and the course itself. Therefore, the intuitiveness of navigating that interface matters. Consider that the time learners are spending trying to determine how or where to submit an assignment is time that they are spending not working on that assignment.

Name and refer to course elements carefully and consistently
Whether it results from a lack of clarity about a word (e.g., resources), similar names for different items (e.g., unit and lesson), different names for the same item (e.g., L07 and Lesson07), or a mismatch between course content and Canvas terms (e.g., groups and teams), unclear wording in a course can easily become a barrier to seamless navigation. Therefore, it is suggested that you:
- Use identical terms for the same item throughout the course. For instance, calling something a discussion forum in one place and a discussion activity in another can be confusing.
- Make sure terms for different items are sufficiently distinct. For instance, while the distinction between dropbox and discussion forum might be clear to designers and instructors, this may not be the case for students.
- Wherever possible be as specific as possible so that students can easily place items within their appropriate context in the course itself.
- Try to match terminology with predetermined wording used within Canvas. For instance, Canvas uses the term groups rather than teams.

Minimize the use of multiple interfaces
In evaluating whether or not an interface in addition to the LMS is needed, it is useful to evaluate the benefits of using that additional system interface against the UX costs of requiring students to move between multiple systems (or “worlds” as one participant described it). In navigating multiple systems, learners are necessarily expending cognitive energy to understand the logic of the different systems rather than on the learning itself.

Design within the logic of Canvas
It is often the case that instructors and designers can develop workarounds to make systems work differently than they were intended. However, in general, the closer the design aligned with the Canvas logic and framework, the easier it was for learners to
navigate. Therefore, it is suggested that, as much as is possible, online courses are designed within the logic of Canvas.

**Group related information in the same location**

Nearly all students who participated in the study would prefer to see related project information in a single location with references linking to that information throughout the course. In this study when students experienced related information located in multiple places, they opened multiple browsers to ensure they were not missing any information. This is not an efficient or intuitive way to navigate a course. Instead it is suggested that as much as is possible, related information is stored in the same location.

**Consider consistent online course designs across the University**

Penn State is a large, complex university containing multiple campuses, colleges, departments, individual programs, and many diverse faculty members with unique and discipline-specific approaches to pedagogy. Additionally, there are new approaches to teaching and learning that might intentionally disrupt more standardized approaches. All that said, there may be certain standards for course design that make sense across the university in general. Additionally, while the focus of this research was in fully online courses and with students who were either true World Campus students or had taken some World Campus courses, the implications could arguably be expanded to all courses with digital components.
**Study Limitations**
This study was conducted in person and required students to come to the University Park (UP) campus to participate. This means that World Campus students who were not able to travel to UP were restricted from participating. Future studies are being considered that will utilize the same methods but leverage web conferencing technologies in order to be more representative of the World Campus student population.

During some of the think aloud observations, there were technical issues that arose. Given that the participants were accessing the sample courses at different times, the solutions to the tasks were not always identical as the visibility of some of the course items varied according to when the test took place. Future studies will be mindful of this factor and will ensure that task completion is not dependent on the timing of the testing.

**Next Steps**
Overall, we feel this study yielded helpful information about how students actually navigate online courses in Canvas and has allowed us to make corresponding practical design suggestions. Future studies will also do more pilot testing and content validation of the task instruments to ensure that what the facilitator intends the participant to do is what is communicated. Areas discussed that might be explored using similar UX methodologies include conducting the same observations but using web conferencing to learn from distributed leaners, faculty members' experiences in online courses in Canvas, student and faculty experience using the Canvas mobile app, and using think aloud observations to study emotions. Please visit our website for ongoing information about our research: https://sites.psu.edu/uxcanvas/
References


Appendix A: Tasks Protocols

Script, questions, and format used for all participants:

<Facilitator script> Thank you for taking the time to come in today. The Researchers would like to learn more about how subjects interact with Canvas, a new Learning Management System (LMS) Penn State University recently adopted. The data collected from this study will help inform best practices for online course development and execution.

Today you will be asked to look at a course entitled <specific course name>. It does not matter if you don’t know the subject matter of this course. You will only be asked to perform certain tasks within this course. There are no right or wrong answers to these tasks. We simply want you to try to perform each task and talk out loud while doing so and then to rate the ease or difficulty of each task. In addition to the tasks, you will also be asked some factual and opinion-related questions.

We ask that you read each question and task out loud before starting the exercise and then speak out loud as you navigate your way through Canvas to try to complete the task. Please don’t be afraid to give your impressions, thoughts, frustrations, etc. as you go through this process.

{{{Please start speaking out loud if you have not done so already}}}

As part of your current World Campus online studies, are you currently using the Canvas Learning Management System (LMS)? Please circle one.
Yes
No
Can’t remember

In addition to any Penn State World Campus course you are currently taking or have taken in the last calendar year, have you participated in any other online higher education course within the last calendar year with have used the Canvas LMS? Please circle one.
Yes
No
Can’t remember

{{{Task #}}}
<Task Question>

On a scale from 1 to 5, where 1 is easy and 5 is hard, how would you rate what it took to accomplish this task? (please circle one)

1 2 3 4 5

Thoughts about this task:
IST Specific Tasks for Think Aloud Observations

Task 1. You have a question on the Lesson 07 Web Usability essay assignment. How would you find out more about this assignment?
Task 2. Your instructor sent an email reminding you to complete the Lesson 03 readings. How would you locate your reading assignments?
Task 3. You would like to receive a weekly email notification regarding course announcements. How would you set-up this notification?
Task 4. You remember you have the Lesson 09 quiz this week, but need to check the submission due date. How would you find out when your quiz is due?
Task 5. You would like to get an idea regarding what assignments and work you have to do next week in the course. Where would you look to check your upcoming workload and assignments?
Task 6. You have a question regarding how to participate in the Lesson 10. DA Human Multitasking discussion forum. Where would you go to find out more information on how to participate?
Task 7. You want to see if your Lesson 01 quiz was graded. How would you go about checking your grade?
Task 8. You want to contact your team regarding your team project. Where would you go to do this?

Additional Open-Ended Questions
- Please speak/list any other thoughts or impressions you have regarding this course in Canvas and the tasks you just performed:
- Imagine you are a student using Canvas for one of your courses and you have a team project. Please tell us your thoughts if you prefer items pertaining to the team project to be all together in a module or distributed throughout module lessons?
- Do you have any thoughts or opinions regarding the structure of the modules area of Canvas?

EMS Tasks for Think Aloud Observations

Task 1: How would you go about finding resources to use for your Capstone Project?
Task 2: Your instructor sent an email reminding you to complete the Lesson 03 readings. How would you locate your reading assignments?
Task 3: You would like to receive a weekly email notification regarding course announcements. How would you set-up this notification?
Task 4: You remember you have the Lesson 03 Activity this week, but need to check the submission due date. How would you find out when your activity is due?
Task 5: It’s <insert current date>. What are your assignments for this week?
Task 6: You have a question regarding how to participate in the Unit 2: Biggest Loser!
discussion forum. Where would you go to find out more information on how to participate?

Task 7: You want to see if your Lesson 01 Activity (quiz) was graded. How would you go about checking your grade?

Task 8: You have a quick question about an assignment you would like to ask another student in the course. How do you go about contacting them in the Canvas system?

Task 9. You received a text notification on your phone with an alert from your faculty member about an upcoming deadline while you were out and about. How will you find that notification once you are back to your laptop?

Additional Open-Ended Questions

- Please speak/list any other thoughts or impressions you have regarding this course in Canvas and the tasks you just performed:
- Imagine you are a student using Canvas for one of your courses and you have a team project. Please tell us your thoughts if you prefer items pertaining to the team project to be all together in a module or scattered throughout module lessons?
- Do you have any thoughts or opinions regarding the structure of the modules area of Canvas?
- Do you have any thoughts or opinions regarding the homepage content in Canvas?
- Have you been in any other courses in Canvas that used something different for the homepage?
- Do you have any thoughts or opinions on the Syllabus in Canvas?
- Do you have a preferred method of receiving notifications, via email or text?
- Do you have any thoughts on the simplicity of the editor when composing an email in the Canvas Inbox?
- Imagine you have five courses in Canvas and need to get your due dates organized for all your projects. Do you use the Calendar in Canvas? If so, which view are you most likely to use to stay organized?

Liberal Arts Tasks for Think Aloud Observations

Task 1. You are ready to submit the Lesson 02 Fundraising Scenario assignment. How would you accomplish this task?

Task 2. Your instructor sent an email reminding you to complete the Lesson 03 readings. How would you locate your reading assignments?

Task 3. You would like to receive a weekly email notification regarding course announcements. How would you set-up this notification?

Task 4. You remember you have the Midterm Exam this week, but need to check the submission due date. How would you find out when your exam is due?

Task 5. You would like to get an idea regarding what assignments and work you have to do next week in the course. Where would you look to check your upcoming workload and assignments?

Task 6. You have a question regarding how to participate in the Lesson 6. Reflection Activity discussion forum. Where would you go to find out more information how to participate?

Task 7. You want to see if your Lesson 05 Case Study Writing Activity is graded. How would you go about checking your grade?
Task 8. You want to contact your team regarding your team project. Where would you go to do this?

**Additional Open-Ended Questions**
- Please speak/list any other thoughts or impressions you have regarding this course in Canvas and the tasks you just performed:
- Imagine you are a student using Canvas for one of your courses and you have a team project. Please tell us your thoughts if you prefer items pertaining to the team project to be all together in a module or scattered throughout module lessons?
- Do you have any thoughts or opinions regarding the structure of the modules area of Canvas?
- Do you have any thoughts or opinions regarding the course homepage area of Canvas?

**WCLD Tasks for Think Aloud Observations**

Task 1. You have a question on the Lesson 9: Television in the Daily Life Text Reaction Report essay assignment. How would you find out more about this assignment?
Task 2. Your instructor sent an email reminding you to complete the Lesson 03 readings. How would you locate your reading assignments?
Task 3. You would like to receive a weekly email notification regarding course announcements. How would you set-up this notification?
Task 4. You remember you have the Lesson 09 quiz this week, but need to check the submission due date. How would you find out when your quiz is due?
Task 5. You would like to get an idea regarding what assignments and work you have to do next week (week 8 for example) in the course. Where would you look to check your upcoming workload and assignments?
Task 6. You have a question regarding how to participate in the Lesson 10: Digital Media Supplemental Notes discussion forum. Where would you go to find out more information on how to participate?
Task 7. You want to see if your Lesson 01 quiz was graded. How would you go about checking your grade?
Task 8. You want to contact your team regarding your team project. Where would you go to do this?

**Additional Open-Ended Questions**
- Please speak/list any other thoughts or impressions you have regarding this course in Canvas and the tasks you just performed:
- Imagine you are a student using Canvas for one of your courses and you have a team project. Please tell us your thoughts if you prefer items pertaining to the team project to be all together in a module or distributed throughout module lessons?
- Do you have any thoughts or opinions regarding the structure of the modules area of Canvas?
Appendix B: Data Analysis

For each task completed by each of the 19 participants, the following data were analyzed:

Each step was fully described: hovering, clicking, reading, scrolling up, scrolling down.

Each task was coded for time, efficiency, effectiveness, satisfaction, and learnability.