

# What and Where Matters: Rethinking Collab

Anshuman Suri  
as9rw

James Ku  
jk2mf

Kamya Desai  
kd4wa

Nidhi Manu  
nm4hf

Rakshita Kaulgud  
rrk7pb

## ABSTRACT

The recent major shift of university and school classes to online learning formats worldwide has been quite challenging for both students and instructors. Different instructors prefer different course management software and websites, leaving students to deal with an assortment of various, disconnected sources of information. Moreover, most of these dashboards are not student-centric, making it difficult for students to easily keep track of upcoming deadlines or find class links.

Based on feedback from users of UVa's Collab (online course dashboard) in a formative study, we designed a dashboard interface that makes it easy for students to obtain important information easily and quickly, without having to dig through multiple tabs for trivial tasks like joining a class. Based on quantitative and qualitative analyses on a user study, we answer two critical questions: what content is most useful to have on an online dashboard, and what content should be made prominent. Overall feedback and hypotheses testing indicate that the proposed dashboard design is faster and easier to use than Collab, providing an overall enjoyable user experience.

## INTRODUCTION

Online dashboards allow instructors and students to interact online; instructors can send out announcements, create assignments, and make all the information needed for class available without creating a website. Students can submit assignments, discuss with instructors and other students, and view all the information made available. While online dashboards make exchanging information easy for both students and instructors, there are still some problems: most dashboards have critical design flaws and are cumbersome to use. Different instructors employ different online learning dashboards, forcing students to switch between different dashboards. All of these hindrances make using online dashboards a sub-optimal experience for students. As visible in Figure 1 (word-clouds based on transcriptions of our formative study interviews), most students are unhappy with their online-learning dashboards.

Based on this common experience, we set out to redesign the current dashboard design common across platforms. The design process revolves around answering the following research questions:

1. **Primary Question:** What content is most useful to have on an online dashboard for students navigating multiple course websites?



Figure 1. This word cloud shows the words that appeared with greatest frequency in the interview transcripts, with the smallest font indicating a frequency of 3 and the largest font indicating a frequency of 11.

2. **Secondary Question:** What content should be made more prominent? Or how can the layout be modified to make the most useful information accessible quickly?

In this project, we conduct an initial formative study to get a sense of common problems faced by students in their day-to-day interactions with online dashboards. We chose to focus on the University of Virginia's online learning dashboard (Collab) for this project. Based on that feedback, we designed a dashboard that, as we posit, would be faster and less cumbersome to use for students. Finally, we deployed our system and, based on extensive quantitative and qualitative analyses of users' experiences via a user study, found that fine-tuning the content showed on a dashboard, along with its layout, has a significant impact on the overall user experience.

## RELATED WORK

With the ongoing pandemic situation, a lot of work is being done in identifying the ideal platform, features, and medium of resources that would make the experience of online learning expedient and lucid for the students. The motivation of our project is to make the important information on a platform concise and accessible without navigating through multiple tabs or links. With this goal in mind, we broke down our process into different parts namely - features, design, methodology, and user study.

According to the survey presented in [3], most of the existing dashboards are designed to suit the needs and requirements of the professors or the institution allowing them to add announcements, class information, syllabus, schedule, monitor student grades, and submissions conveniently. To make the dashboard

easier to use for the students, we propose a student-centric design with content based on the inputs of our participants. The studies presented in papers [2, 5] suggest that keeping track of deadlines and submissions create stress and anxiety among students. To solve this, [5] introduced a reminder app called the ‘Homework Suite Planner’ app to remind students about their deadlines, in hopes of reducing stress level among students.

Pain Points	Fraction
Finding meeting links	3 out of 4
Keeping track of assignment deadlines	4 out of 4
Navigating multiple platforms to get desired information	2 out of 4
Cluttered Collab dashboard	3 out of 4

Table 1. Key pain points for the users of the existing platforms

Content and graphics are the two major components of any dashboard. These works [1, 4] formed the base reference for identifying the important features to be included from a student’s perspective and ideal content to have on a dashboard. For our design implementation, we draw inspiration from [6] that gives us a better understanding of organizing static information in a way that is readable, concise, accessible in-a-glance.

Lastly, our overall design life-cycle was based on [8], where interviews and feedback formed the major part of our project. To make our dashboard as customizable as possible and to maintain our goal of user-friendliness, we conducted formative and summative assessments. The inputs from the participants were embodied in the first version of our dashboard. We then recruited participants to test the usability of our system, and the feedback received was used to evaluate our dashboard.

Content Goals	Fraction
Notifications/reminders via email	4 out of 4
Notifications/reminders via app/bot	1 out of 4
Meeting links/Calendar view	3 out of 4
Deadlines in one place	3 out of 4
Track upcoming deadlines	4 out of 4

Table 2. Features to be included in the student-centric dashboard

## METHODOLOGY

Our project progressed in three phases: a formative study to gauge what students want in an ideal dashboard, implementing the dashboard, and conducting a user study with quantitative and qualitative analyses to gauge the efficacy of our dashboard design.

### Formative Study

The goal of our formative study was to gain insight into students’ experiences with online dashboards and platforms: assessing common pain points and gauge what students are looking for in an ideal student-centric dashboard.

The study involved interviewing four students (gender-balanced: three graduate, one undergraduate): talking about the online dashboards their courses used, along with things

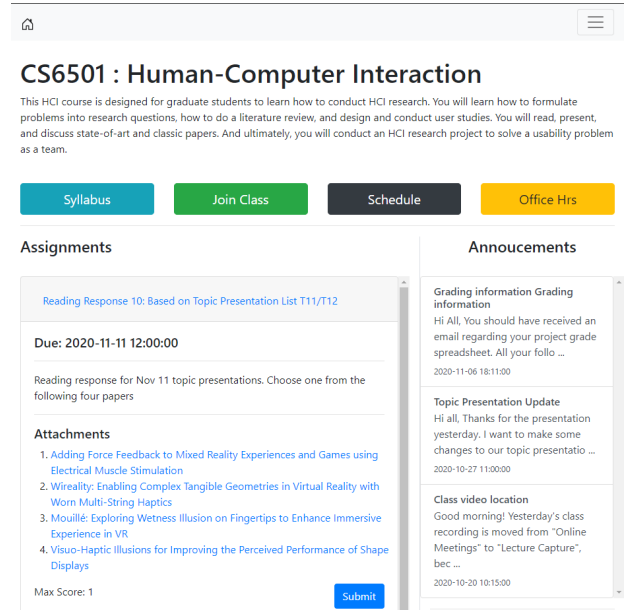


Figure 2. Course-specific view for the HCI course. Assignments and announcements are visible easily, in addition to quick button-links to join class and office hours.

they liked and/or disliked about those dashboards. As summarized in Table 1, keeping track of meeting links and assignment deadlines, along with the stress brought about by a cluttered dashboard, were one of the most common problems students faced.

Shifting our focus to features that students want most in a dashboard (Table 2), features like a functional calendar view, reminders for deadlines, and a combined deadline view were among the most wanted features. Building on top of this feedback and our own insights and analyses of these dashboards, we came up with mock designs and chose to implement a design that we felt would be liked by most students.

### Dashboard Design

Based on inputs received from potential users in the formative study, we identified the most important features and information to be included in an ideal dashboard. We designed a dashboard so that the most critical and important information is featured more prominently and ideally at a glance, thus making it as user-friendly as possible.

The design includes two main kinds of views. The home/landing page includes a calendar view, populated with the user’s classes and deadlines. All of these entries in the calendar are clickable, with links leading to extra information/class links. On the side of this landing page, a collective list of upcoming deadlines across all courses is included with the amount of time remaining before each is due. The course-page (for any given course), as visible in Figure 2, includes quickly-accessible links (office hours, class links, syllabus), along with a scrollable view of announcements and a cascade view of assignments.

## Implementation

Given the lack of any API support for Collab (for login), we had to collect course-wise information for various courses via our participants in the first phase of our user study. This process involved us taking note of course information like deadlines, class links, etc. to add to our database.

We used Python as our main programming language: constructing a Flask-based backend server, along with a front-end view rendered using HTML. Bootstrap framework was used to render modular views that would work well on all kinds of devices. To enable better collaboration between the authors, an Excel-file based database was employed. For reference, our implementation is available here: <https://github.com/iamgroot42/owca>

## User Study

We performed a user study with 11 participants all of whom are current students of the University of Virginia. Of the 11 participants in the study, 5 identified as female and 6 as male. 8 participants were from the Computer Science department, 2 from CPE, and 1 from the English department. 9 of the participants were from the Masters of Science program and 2 from the Ph.D. program. The average number of courses taken per participant was 2. Most of these studies were performed remotely through an online video conferencing platform, though, in cases where it was possible, they were conducted in person.

We employed both quantitative and qualitative feedback approaches to effectively evaluate our platform in this user study. The participants were given several tasks to perform on both our platform and the existing platform, Collab, and once the tasks were completed they were asked a series of questions related to their experience as well as feedback in general.

## Hypothesis

For the experiments that we conducted, we hypothesized the following for each task:

1. Our dashboard will take fewer clicks than Collab
2. Our dashboard will be faster to use than Collab

Finally, we posit that if we design a dashboard so that it displays important information “at a glance”, it leads to:

1. Fewer clicks needed
2. Less time needed, and therefore it leads to
3. Higher user ratings

## Quantitative evaluation

In the quantitative part of our evaluation, we performed a ‘Task’ based experiment where each participant was asked to perform 5 tasks once on our dashboard and once on Collab, making the platform an independent variable in our study. These tasks reflected the routine tasks that students generally use Collab or any other similar dashboard for. We also asked the participants to complete the tasks as quickly as possible to imitate a real-world scenario of students being busy and in a time crunch. The tasks we specifically asked the subjects in the study to perform were:

1. **Task 1:** Join a class (the one that’s coming up next)
2. **Task 2:** Find the next upcoming deadline
3. **Task 3:** Find all things due in the next 3 business days (only deadlines)
4. **Task 4:** Find all things to do on the next working day (deadlines and lectures)
5. **Task 5:** Find the day that is most convenient for planning an outing from a given set of days (no deadlines, no lectures)

For each of these tasks, we measured two dependent variables: how much time (seconds) and how many clicks it took the participant to complete the task. We also observed participant behavior to note if these tasks seem tedious or frustrating for the participants. After having them perform the same tasks with our dashboard and the existing platforms, we calculated and compared the results. This comparison supplemented our observations of the participants while they were doing the tasks. Additionally, we also sent all the participants an email reminder 15 minutes before the user study meeting, resembling the content and style of the email reminder system that we propose as a part of making the online dashboard design more student-friendly. We solicited their feedback on this feature and their preference for the email reminder sent by us as well as what they would like to see in such a notification system.

## Qualitative evaluation

After completing all the tasks, participants were asked to complete a survey on their experience using the existing platform vs. our dashboard. Some of the sample questions included in this feedback were:

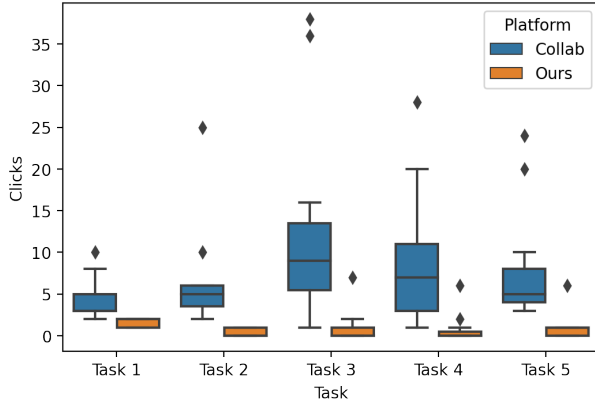
1. Rate your experience (out of 5) for using our dashboard. How about Collab (for relative comparison)?
2. To what extent were these tasks representative of what you usually open these course websites for (out of 10)?
3. Did you find the email notification helpful? If we did this for course deadlines, would that be useful?

The feedback that we received from the post-task survey was used to further bolster the evaluation of our dashboard, and give us more perspective on making it more user friendly in the upcoming iterations.

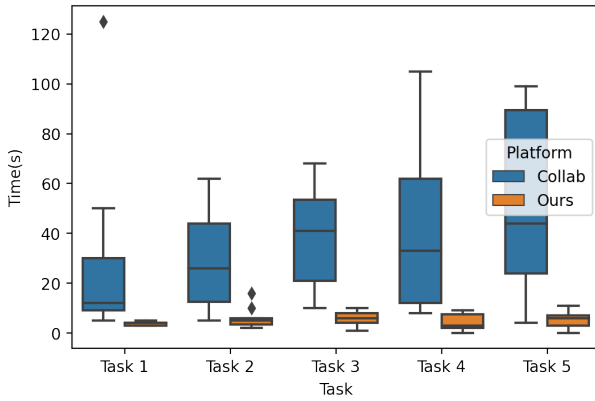
## RESULTS

### Quantitative

We graphed the number of clicks and the amount of time taken as shown in Figures 3 and 4 respectively, for each platform. The general trend suggested that, as expected, it took participants more clicks and more time to complete each task on Collab than on our dashboard. The box plots had outliers, particularly for the number of clicks, and Levene’s test showed that the data did not have an equal variance for most tasks. Thus, we chose to conduct Wilcoxon signed-rank tests [7] to verify the findings instead of one-tailed paired t-tests.



**Figure 3.** Box-plots for number of clicks taken on Collab (blue) versus on our design (orange) for each task.



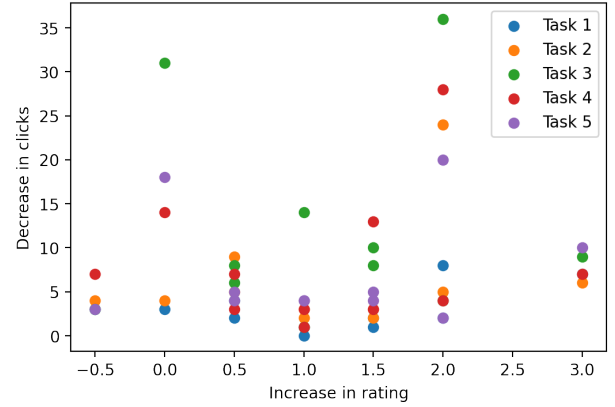
**Figure 4.** Box-plots for time taken (seconds) on Collab (blue) versus on our design (orange) for each task.

For the number of clicks, we found that a Wilcoxon signed-rank test for Task 1 showed that the number of clicks needed on Collab was statistically significantly higher than on our dashboard ( $W = 55$ ,  $p < .01$ ,  $r = 1$ ). For Tasks 2 through 5, the number of clicks needed on Collab was also statistically significantly higher than on our dashboard ( $W = 66$ ,  $p < .01$ ,  $r = 1$ ). So, we can reject the null hypothesis that the median number of clicks used on Collab was the same as or less than the median number of clicks used on our dashboard for each task with greater than 99% certainty (medians and ranges shown in Figure 3).

For the amount of time taken (in seconds), Wilcoxon signed-rank tests for all tasks showed that the amount of time taken on Collab was statistically significantly higher than on our dashboard ( $W = 66$ ,  $p < .01$ ,  $r = 1$ ). In other words, we can reject the null hypothesis that the median amount of time spent on Collab was the same as or less than the median amount of time spent on our dashboard for each task with greater than 99% certainty (medians and ranges shown in Figure 4).

### Qualitative

We also analyzed the rating each participant gave to their experiences using Collab and using our dashboard. On average, participants rated the experience on Collab as 2.82 out of 5



**Figure 5.** Increase in ratings (from Collab to our design), compared with the decrease in clicks (from Collab to our design) for all users across all tasks.

and on our dashboard as 3.95 out of 5. So, our dashboard showed an average score of 1.14 points higher than Collab. When asked directly, 9 out of the 11 participants stated that they found our dashboard to be better than Collab.

### DISCUSSION

With the help of our dashboard design and evaluation, we answer both of our research questions:

1. *What content is most useful to have on an online dashboard for students navigating multiple course websites?*

With the help of our **course-page design**, we conclude that frequently-used things like upcoming deadlines, announcements, and links to join class and meetings, are most helpful to have on the dashboard for students.

2. *What content should be made more prominent? Or how can the layout be modified to make the most useful information accessible quickly?*

With the help of our **home-page design**, we find that including important views like a combined list of upcoming deadlines and a functional week-planner should be made most prominent on a dashboard, along with layout modifications that make it easy to identify different courses.

To reinforce the fact that our design's superiority in overall user experience is not just a consequence of it being faster, we performed correlation analyses between a decrease in the number of clicks from Collab to our dashboard, compared to an increase in ratings. We performed these analyses for all 5 tasks and repeated them for a decrease in time taken (in seconds) instead of clicks as well.

As visible in Figure 5, there is no clear correlation pattern for any task(s). We observed similar trends when analyzing the decrease in time taken. Although being faster and requiring fewer clicks is a consequence of our dashboard design, it is not the sole reason why users prefer it over Collab. Its ability to provide a better overall experience via an intuitive, clean, and functional design is what leads to its better ratings.

To further put things in perspective, we calculated that the average student (2 courses, 14 weeks of classes, 2 classes

per week per course) currently spends over **25 minutes** each semester doing the most trivial of tasks: joining a class. Our design, on the other hand, when used would require less than **4 minutes** per semester for the same task. These findings, in addition to pointing out obvious design flaws in the current dashboard system, help us realize how much time and effort (both physical via clicks, and mental energy) students end up putting in for trivial tasks such as digging through multiple tabs to find assignment links, class links, and keeping track of course deadlines.

### Limitations

Although we had a decent number of users for our study, it would be better to have a larger sample size. We acknowledge that most of our subjects had 2 courses, which is not representative of the distribution of course-load for undergraduate students. Owing to the commitments for time requirement and our two-phase interview design, finding undergraduate student volunteers was not possible. We suspect a student with more courses would only get higher benefits from our dashboard: confirming this hunch via repeated experiments, perhaps with additional tasks, is something worth exploring.

The inability of the authors to reach out to potential users from other schools (because of restrictions put in place by the ongoing pandemic) resulted in all but one of our volunteers being from the Engineering school. Based on the insights we received from just one of our participants being from another (Arts) school hints at the potential insights we might gain by including students from other schools.

Even though users rated our tasks an 8 out of 10 in terms of covering their use cases on Collab, there is scope for improvement. Particularly, checking grade information and covering grading-based tasks (for TAs) were the two most frequently pointed-out missing tasks. An updated dashboard design to allow students to access these views easily, along with tasks in our evaluations, should be part of the next iteration of this study.

### Future Work

Based on the feedback from our participants, we identified the following features that users would like to see in a future iteration:

- Grade-book for each course
- Embedded discussion forum instead of a link
- Course-wise resources (readings, etc)
- A fixed calendar (instead of the "current-day-first" view), along with an option for users to modify it according to their schedule
- A feedback mechanism to allow students to prioritize their deadlines

The features mentioned above would help give a sense of completeness to the dashboard. However, incorporating these features would be a non-trivial task: increasing the volume of information would directly impact usability, making it hard

to extrapolate or predict how users might respond to a version with these features. We leave the next iteration of our dashboard design with the above features as part of future work.

### Conclusion

Based on our observations while shifting to a fully-online learning environment, we posited how online student dashboards can be cumbersome and lead to an unpleasant experience. Through a formative study, we highlighted pain points that bother students the most, along with content they would want to see in an ideal dashboard design. We then framed our primary and secondary research questions: trying to figure out what content is most useful on an online dashboard, and how the layout should be modified to make useful information accessible easily.

Motivated by all of this information, we built a functional dashboard design that, as we posited, would be quicker than Collab and provide an enjoyable experience. Through a thorough set of quantitative and qualitative evaluations from a user study, we answered our initial research questions. Analyses on the studies' measurements point towards the superiority of our design, both in terms of speed and usability.

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