

# Low-Fi Prototype Testing Report

Trisha K., Juliette K., Daniel R., Angela C.



## Introduction

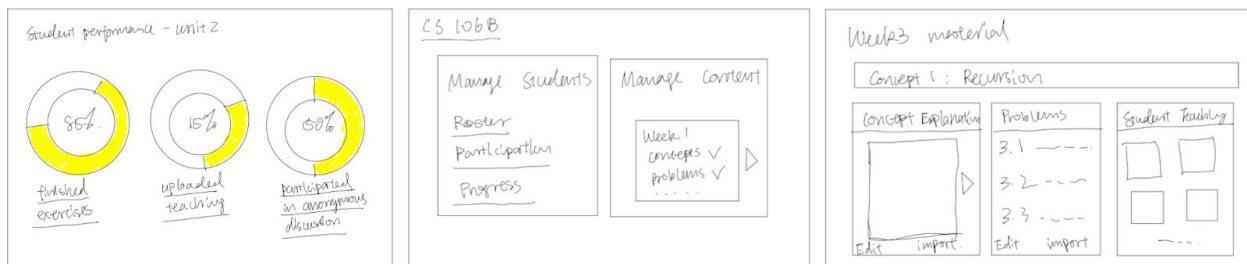
This quarter, our team has been exploring the needs of students and educators in the space of post-secondary CS education. Through need-finding interviews, generating HMW's and solutions, and finding a task flow and low-fi prototype we wanted to test, we have arrived at the following mission and problem solution overview regarding mutually beneficial student collaboration.

**Mission:** CoCode exists to provide a welcoming and collaborative space that empowers students in CS classes to learn and share their knowledge with their peers.

**Problem Solution Overview:** Introductory CS courses are popular as ever. Yet, factors of intimidation, stress, isolation, and limited resources prevent many students from finding belonging and empowerment in their coursework. We strive to create a space where students can eliminate the need to compete, feel judged, or force one type of collaboration. Instead, we want students to work with their peers for their particular needs and on their own terms.

## Sketches

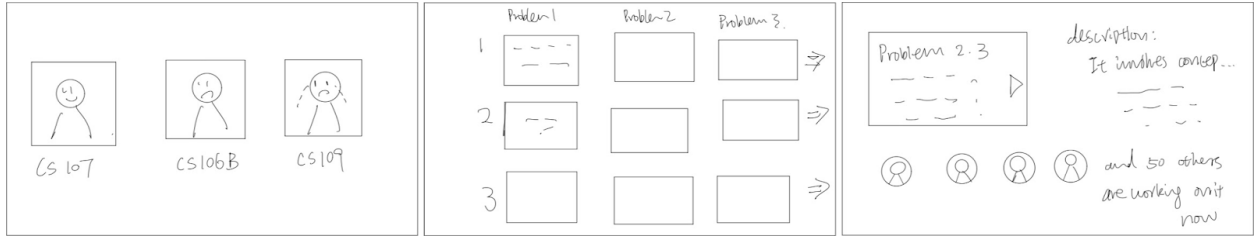
We aimed at creating easy-to-navigate interfaces so that students can easily find their desired collaboration means or groups. We generated 5 concepts that included designs for tablet, desktop, and VR.



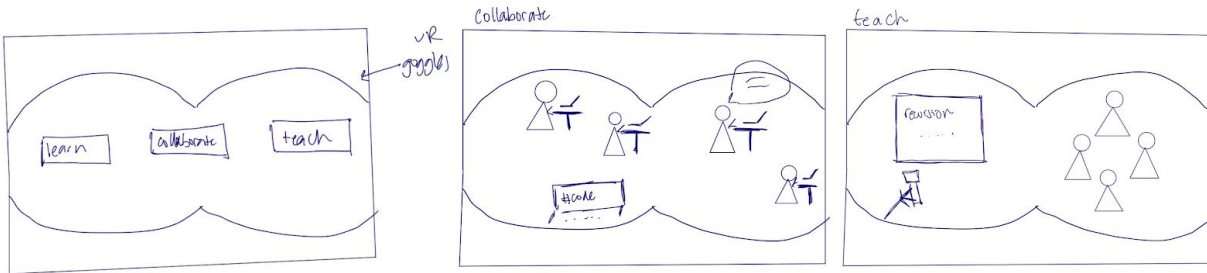
**Figure 1:** Tablet application for educators: instructors/TAs can use this tablet application to monitor students' progress and manage the resources on the platform.



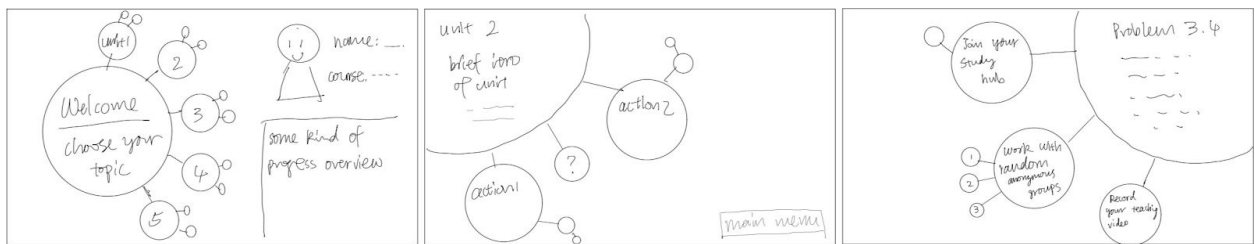
**Figure 2:** Search-based web application for students: students can search keywords of concepts or problems



**Figure 3:** Netflix inspired concept/problem-oriented web application for students: they choose a specific problem under a concept and decide how they want to collaborate



**Figure 4:** VR study room for students: students can experience a real-life study group



**Figure 5:** Prezi-inspired design: course concepts are arranged in a visual hierarchy; primary form of navigating is zooming in to the area of interest

## Top 2 Designs for further Storyboarding

We chose to further storyboard the Netflix-inspired and VR designs because they are two distinct concepts that would be engaging and encourage students to collaborate efficiently and effectively.

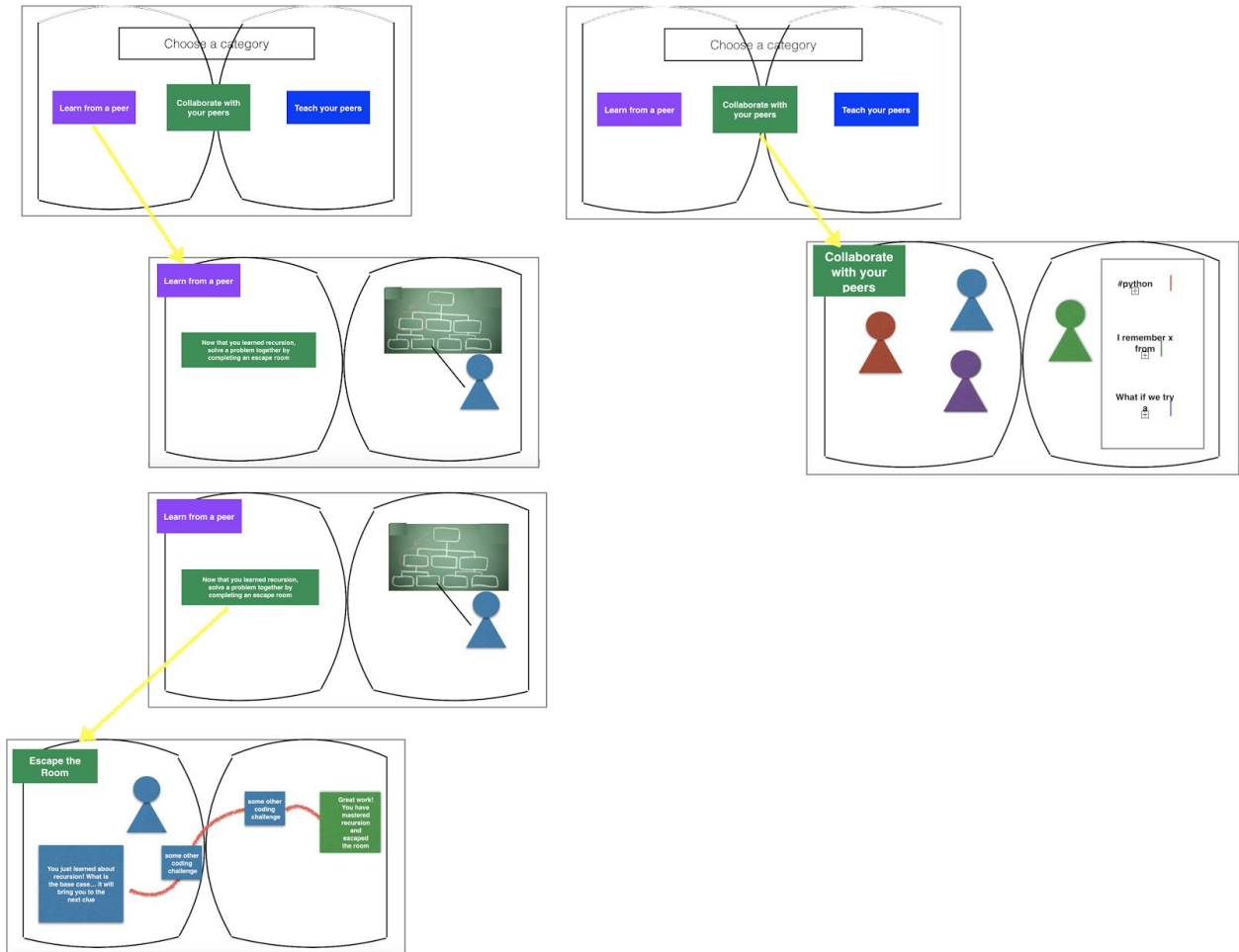
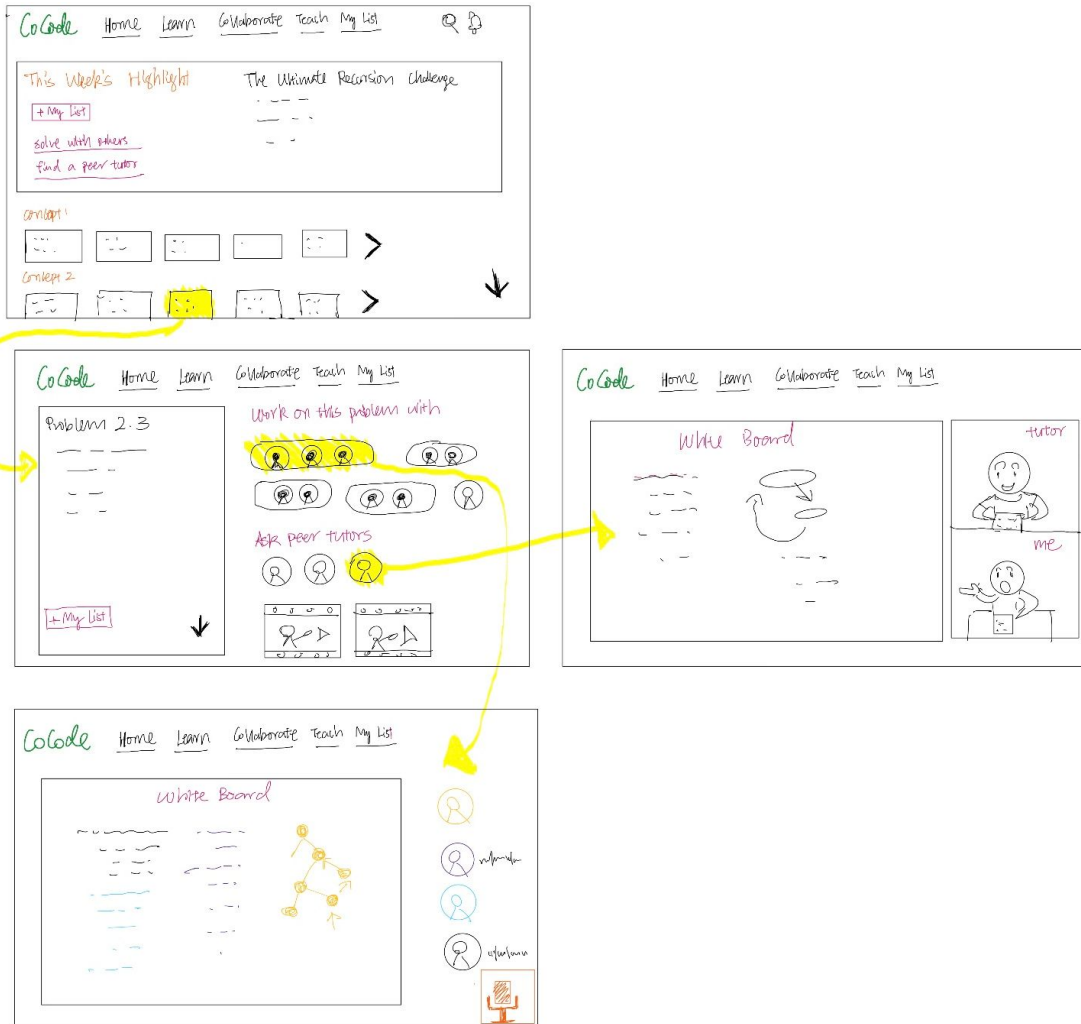
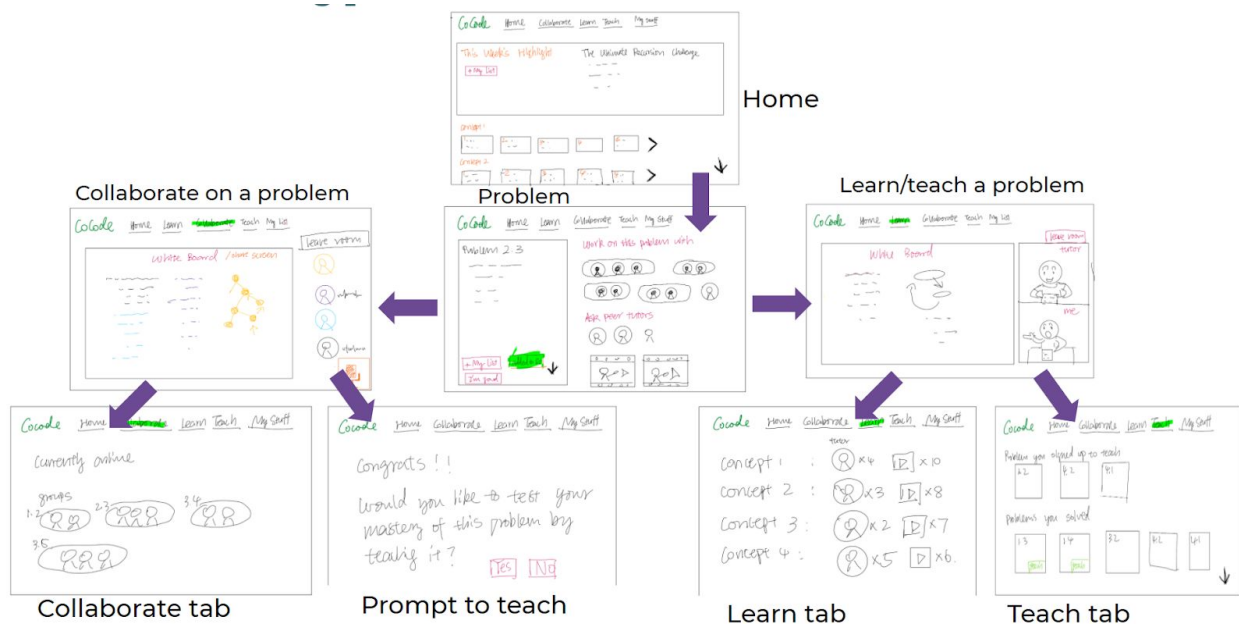


Figure 6: Storyboard realization for VR concept



**Figure 7:** Storyboard realization for Netflix-inspired design



**Figure 8:** Detailed storyboard for Netflix-inspired design

### Selected Interface Design

We chose to pursue the Netflix-inspired design. We felt that the computer web-oriented interface was well-suited to the problem space, as this allows the design to more closely mirror the students' typical experience when working (e.g., typing code at a computer is the typical process for working on an assignment). We also thought that having the problem-based navigational focus would be organized and logical enough for the students to pick it up with (relative) ease. We also hoped that the pseudo-Netflix parallel would help students find exploring CS problems fun, and we hoped that the tapping into the sem-familiar design would help reduce the burden of learning the tool.

### VR Concept

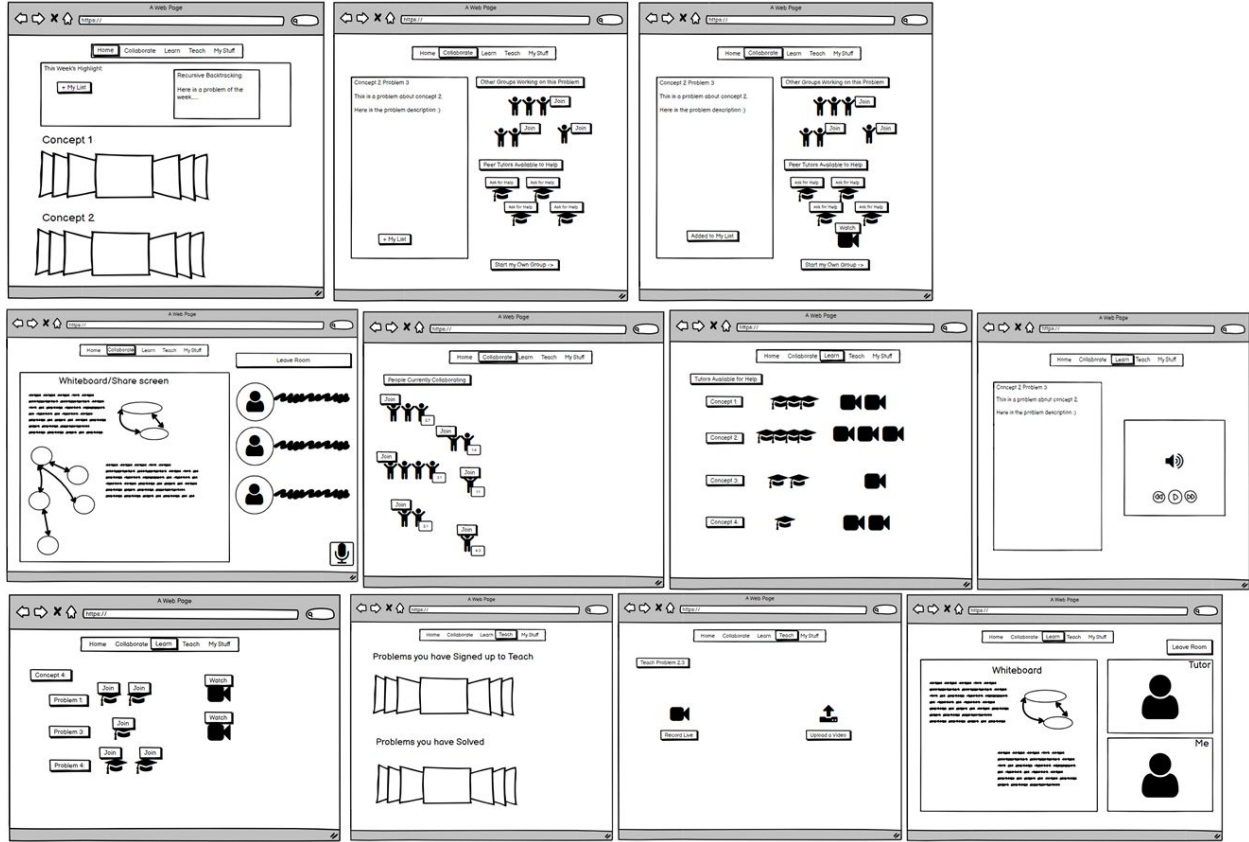
Pros	Cons
<ul style="list-style-type: none"> <li>Immersive experience-simulate real-life study group/office hour</li> <li>Versatile for many creative activities such as coding escape room</li> <li>Optimal for real-time interaction</li> <li>Differentiates from traditional platforms-makes learning much more interesting</li> </ul>	<ul style="list-style-type: none"> <li>Requires additional equipments</li> <li>Hard to get used to the coding environment</li> <li>Technically expensive to implement</li> </ul>

### Netflix Concept

Pros	Cons
<ul style="list-style-type: none"> <li>• Web application is ideal for typing and sharing screen</li> <li>• Problem-oriented navigation—fits perfectly with average students behavior, organized and logical</li> <li>• Tap into familiarity to lower tool-uptake time</li> <li>• A space for all types of collaboration—easy to customize</li> </ul>	<ul style="list-style-type: none"> <li>• The concept is not as novel</li> <li>• There are more substitutes</li> <li>• Multiple functions may be hard to distinguish</li> <li>• Possibly difficult to deal with cheating</li> </ul>

**Prototype Description**

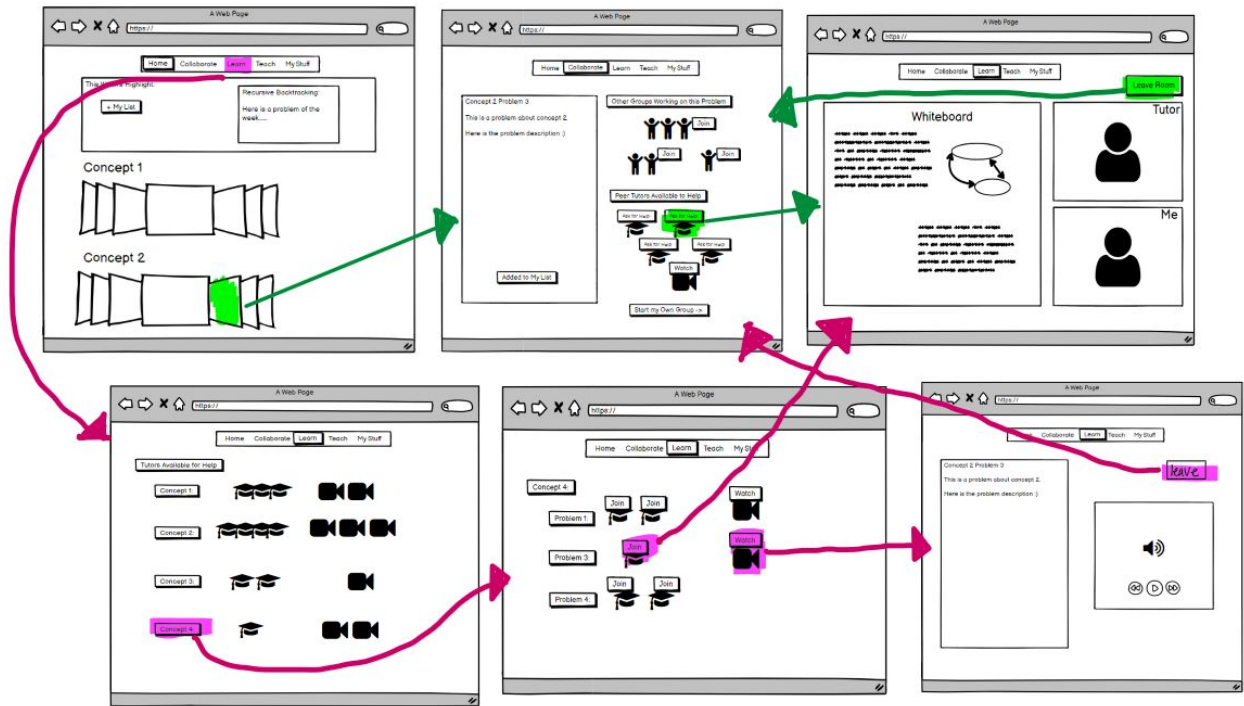
We chose Balsamiq to present our prototype drawings.



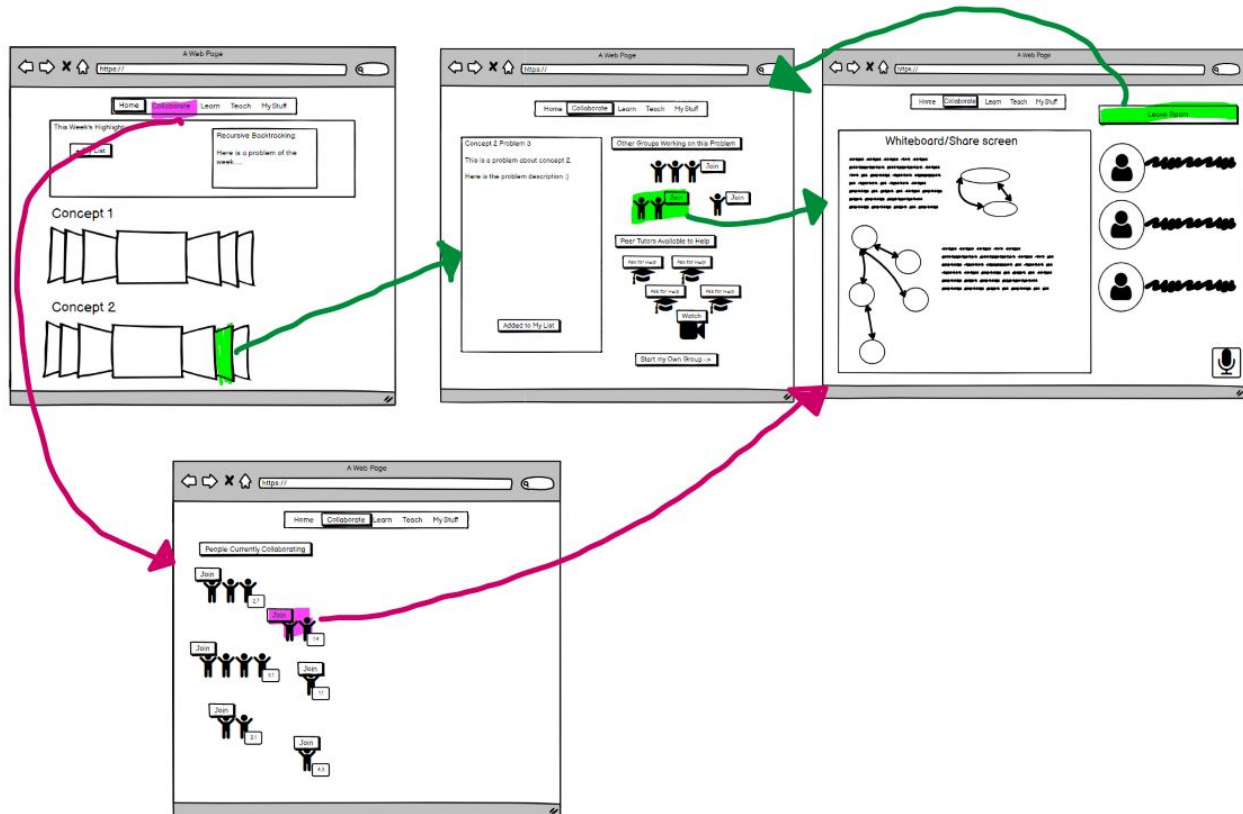
**Figure 9:** Screens of prototype

<b>Interface Element</b>	<b>Functionality</b>
Home tab	Brings users back to list of concepts/questions
Collaborate tab	Takes users to list of available study groups
Learn tab	Takes users to available tutors and videos
Teach tab	Takes users to questions they signed up to teach
My stuff tab	Users' saved problems, teaching resources, history, etc.
Concept/problem screen	Lets users find problems they are interested in
Add to list button	Adds problem for later
Problem screen	Shows the problem, available study groups, and tutor resources
Collaborate screen	Lets users communicate via audio while editing on the whiteboard
Teaching/learning screen	Lets users video chat while editing on the whiteboard

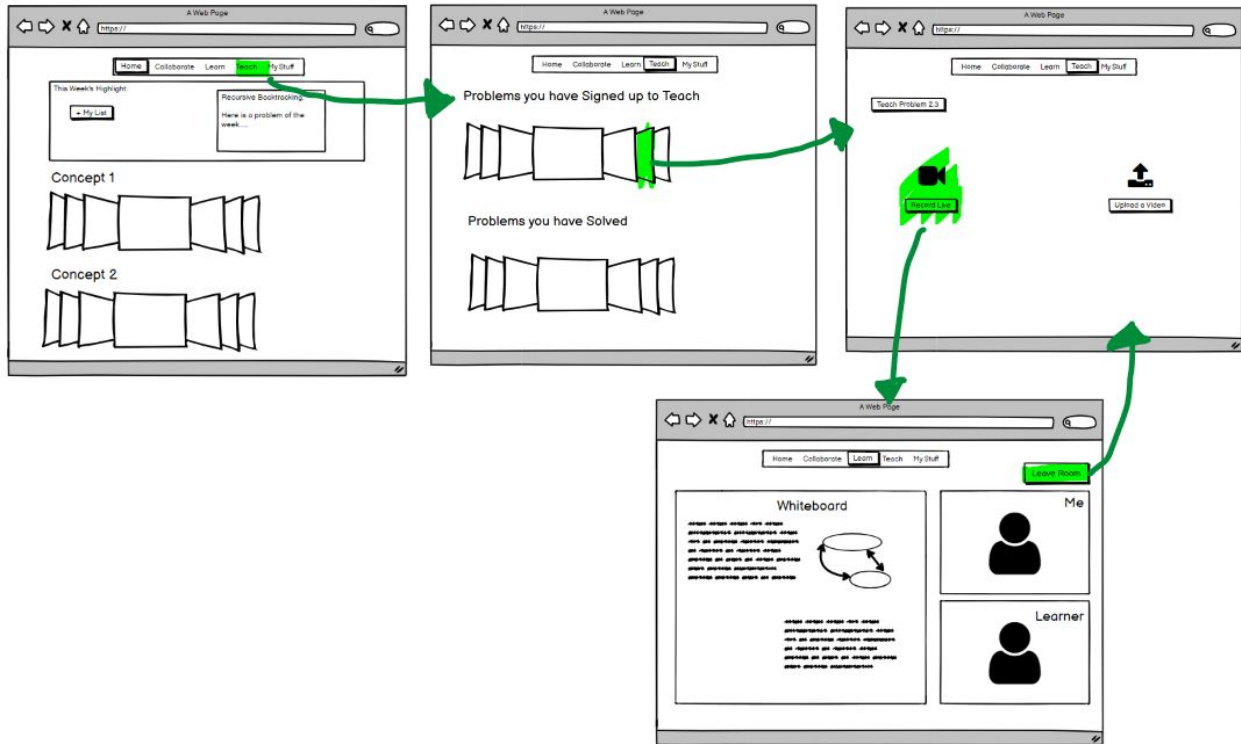
## Task Flows



**Figure 10:** learn from a peer tutor/recorded video to solve a problem



**Figure 11:** find a group to collaborate with on a problem



**Figure 12:** teach a saved/solved problem to a peer

## **Testing Methodology**

To test our low-fi prototype, we connected with three people who are friends of friends. The first participant is a junior studying humanities at a liberal-arts-college. We chose him to test how well our site could be navigated by students who take an introductory CS course without a STEM background. The second participant is a recent college graduate who majored in computer science. From him we wanted to learn how our site compared to the existing task flow in post-secondary CS courses. The third participant is a masters student in East Asian Studies at Stanford and is currently in CS106A. We wanted to get her insights on how intuitive this site is for someone in their first computer science course.

We met with participants over Zoom. Trisha was the observer, Daniel was the note taker, Angela was the facilitator, and Juliette was the computer. We presented the participants with three tasks: learn, collaborate, and teach. (See appendix for a more detailed script).

The participants started out on the homepage of the website for each task. While the participants interacted with our low-fi prototype, we measured how easily the participant found necessary pages, if they were able to intuitively solve the task without our guidance, and their level of frustration.

## **Results and Discussion**

Our interviews revealed two main avenues in which we want to keep improving our product: intuitive use and additional features.

When interviewees browsed our home page, we noted confusion regarding whether the “learn” or “collaborate” tab best suited their needs for task one and two respectively. This finding revealed a need for a more intuitive order to our tabs.

The general workflow to teach a problem is also confusing. Our interviewees did not know if they should click the “teach live” button and wait for a student to join or if there would be some other process. Creating a sign-up page for teaching a particular concept that then would be mirrored on the “learn” end could be a more effective use of time. Upon clicking the “teach live” button, one interviewee pointed out that they would feel more comfortable as a student if these sessions were individualized and not prerecorded. This makes the process more casual which is the vibe that we want on our site.

We also learned that the white board feature was not intuitive at first glance. Providing buttons such as “draw” or “code” makes sense as a next step to guide the user in knowing their options and hopefully lower the barrier to entry for new students wanting to teach.

The suggestions we received also created new feature ideas that we want to investigate moving forward. In the first task, when a student is stuck starting a problem, we see value in integrating class materials to allow students to review before any group work. We also want to expand our tooling for our white board. Having options to draw, live code, chat, and take personal notes would facilitate more customizable interactions depending on students’ needs. Finally, we want to consider the benefit of saving and displaying group progress. When choosing which room to join to collaborate, interviewees expressed a desire to know the status of the group, including who was in the room and how far they had progressed in the problem. Saving white board images and chat history could additionally serve as a metric for course staff if they want to monitor activity on the site.

## Appendix A: Script for Task Scenarios

1. “You are taking an introductory computer science class on data structures. It is later in the evening, and you weren’t able to make it to lecture or office hours earlier in the day, which has resulted in you being **very stuck getting started on problem four**. You go onto this platform **seeking a conceptual explanation** on breath for search algorithms. Where do you go?”
2. “You are preparing for a final exam worth a big portion of your grade, and you go onto our platform **seeking discussion and practice** with concepts. There are a few clarifications you want to receive about a data structure used in problem four, but you also feel like you **have some understanding to share**. Where do you go?”
3. “After studying for your exam for many hours and **succeeding** in practicing problem 4 on our platform, you feel much stronger about your understanding of a tough concept. You decide you want to **test your mastery and share how you came to think about the problem** with others. What do you do?”

## **Appendix B: Detailed Results**

Here is a more detailed list of what we learned in our interviews.

1. Most interviewees wanted to review course material before jumping in to a problem and assumed it would be possible from our side but there wasn't really a way to do that.
2.  $\frac{2}{3}$  interviewees wanted options for anonymous and non-anonymous
3. Confused at how the screen-sharing would work
4. Preferred video or had no preference (other people have other preferences)
5. Interviewees would watch pre-recorded videos first when they are learning but when they are teaching, would prefer to teach live
6. Found it showing the most recent course material. Didn't intuitively know this would be mostly for review of earlier topics rather than practicing the new ones
7. One interviewee wanted to see people's names to decide which groups to join
8. Confused about how to sign up to teach a problem
9. Distinction between collaboration and learning is group vs. one-on-one
10. Would like the option to continue working on problems with this group
11. All want a chat feature like on Zoom
12. If they are going to peer teach, they want to teach other students in real time
13. Students want a way to review course material directly from the site
14. Students will benefit from a collaborative document rather than one person screen sharing

## **Appendix C: Critical Incident Logs**

Incidents were categorized using the following ratings: 0 = no problem, 1 = cosmetic problem, 2 = minor usability problem, 3 = major usability problem, 4 = usability catastrophe

### **Participant 1**

#### Task 1

Incident	Severity Rating (0–4)
Wanted to be able to continue working on different problems with the same people	2
Would try to save work before leaving room	2

#### Task 2

Incident	Severity Rating (0–4)
Layout encourages doing multiple problems for the same concept	0
Slight confusion about how the whiteboard/share screen functionality works	2
My Stuff not yet implemented, but sounds useful	1

#### Task 3

Incident	Severity Rating (0–4)
Unclear about teaching process—do they just pick a problem and hope students want to learn about that problem	4
It would be useful to be able to upload multiple videos in one “folder”	2
Would prefer teaching synchronously to an asynchronous recording	3

### **Participant 2**

#### Task 1

Incident	Severity Rating (0–4)
If I just want help from a peer tutor, I'd probably just click ask for help	0

Unsure how to interact with the whiteboard	1
--	---

### Task 2

Incident	Severity Rating (0–4)
Would go to the teach tab to share understanding with others	0

### Task 3

Incident	Severity Rating (0–4)
Not sure how to sign up to teach a problem	1
Some confusion regarding when to use the teach tab and when to use the collaborate tab	2
Would prefer teaching live to doing a video	3
Might want the option to save a live session, so other students can reference it	2

## Participant 3

### Task 1

Incident	Severity Rating (0–4)
Expects overview of Concept 2 when clicking on the text of Concept 2	2
Expects learning materials on the learn page	2
Unsure what the hat and video symbols indicate	1
Missing obvious way to return to the problem page from video page	3

### Task 2

Incident	Severity Rating (0–4)
Expects something like a discussion forum under the collaborate tab	1
If curious about what others are discussing after finishing with one group, might join another	0

### Task 3

Incident	Severity Rating (0–4)
Wonders about Teach section—not clear that it may be for students	2
Would prefer teaching synchronously for time reasons	3

## **Appendix D: Blank Consent Form**

### **Consent Form**

Cocodes's prototype is being produced as part of the coursework for Computer Science course CS 147 at Stanford University. Participants in the experimental evaluation of this prototype provide data that is used to evaluate and modify the interface of Cocode. Data may be collected by interview, observation and questionnaire.

Participation in this experiment is voluntary. Participants may withdraw themselves and their data at any time without fear of consequences. Concerns about the experiment may be discussed with the researchers (Angela Chen, Trisha Kulkarni, Daniel Rebelsky, Juliette Woodrow) or with Professor James Landay, the instructor of CS 147:

James A. Landay  
CS Department  
Stanford University  
650-498-8215  
landay at cs.stanford.edu

Participant anonymity will be provided by the separate storage of names from data. Data will only be identified by participant number. No identifying information about the participants will be available to anyone except the student researchers and their supervisors/teaching staff.

I hereby acknowledge that I have been given an opportunity to ask questions about the nature of the experiment and my participation in it. I give my consent to have data collected on my behavior and opinions in relation to Cocodes's experiment. I also give permission for images/audio records/video of me using the prototype to be used in presentations or publications as long as I am not personally identifiable in the images/audio records/video. I understand I may withdraw my permission at any time.

Name \_\_\_\_\_

Participant Number \_\_\_\_\_

Date \_\_\_\_\_

Signature \_\_\_\_\_

Witness name \_\_\_\_\_

Witness signature \_\_\_\_\_