Magic HW

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Introduction

Mission Statement

Homework that Helps You!

Problem / Solution Overview

With long lecture videos, multitudinous lecture slides, and little one-on-one time with instructors, it's difficult for students to get the information they need. MagicHW aims to make it easy for students to find the exact resources that they need, as well as provide personalized feedback on homework assignments and tailored exam review material to cater to their unique strengths and weaknesses.
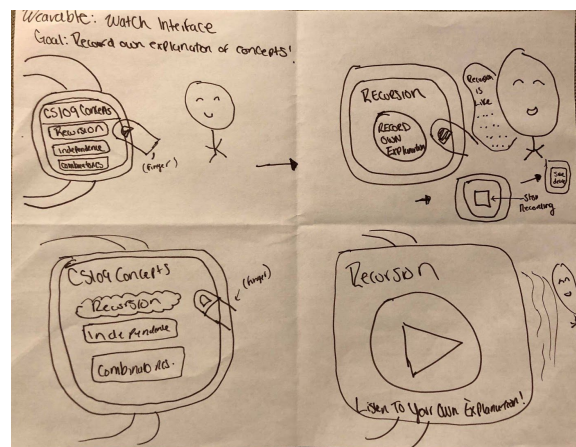
Sketches

First Round:
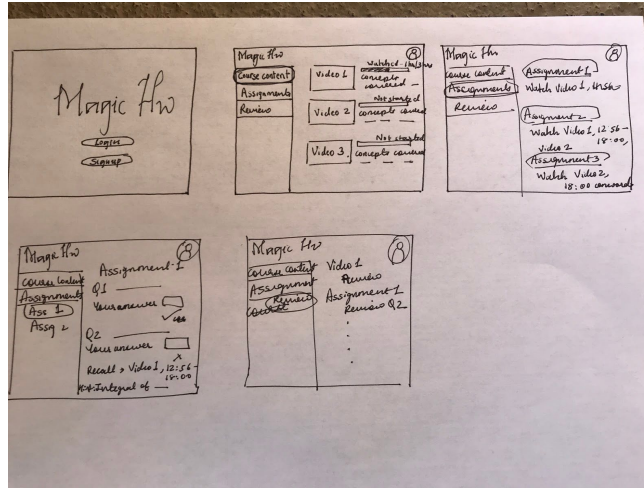

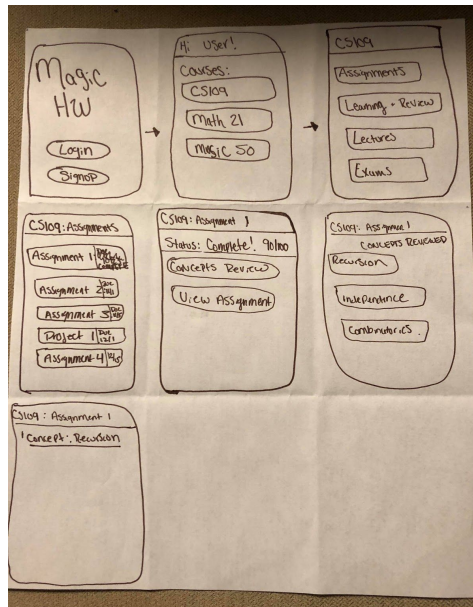Fig. 1) Wearable interface

Fig. 2) Dashboard web interface

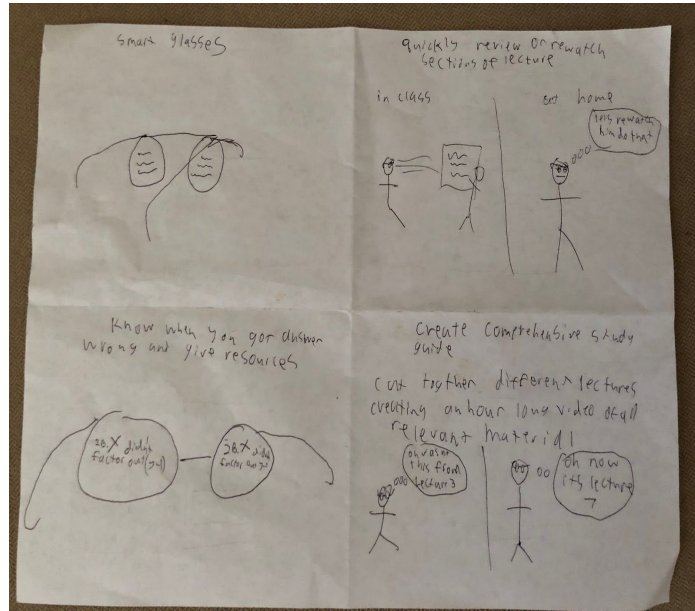Fig. 3) Native phone recursive menu navigation

Fig. 4) AR interface

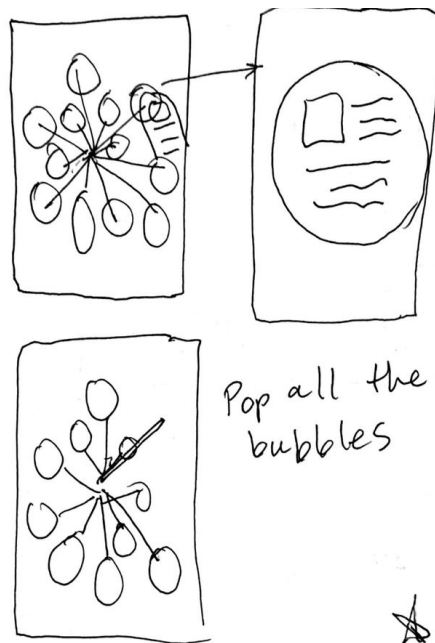
Fig. 5) Bubble Pop native phone interface
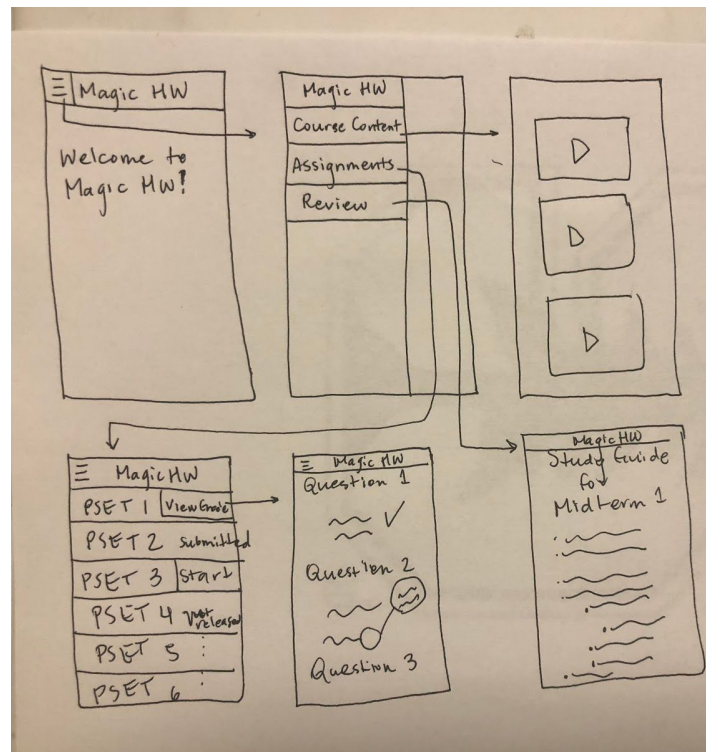
Second Round (Top 2 designs):

Fig. 6) Native phone side menu interface

We combined the design of the web app and the native phone interface to create a native phone interface with a side menu, in which students can access Course Content, look through Assignments, and Review for an exam.
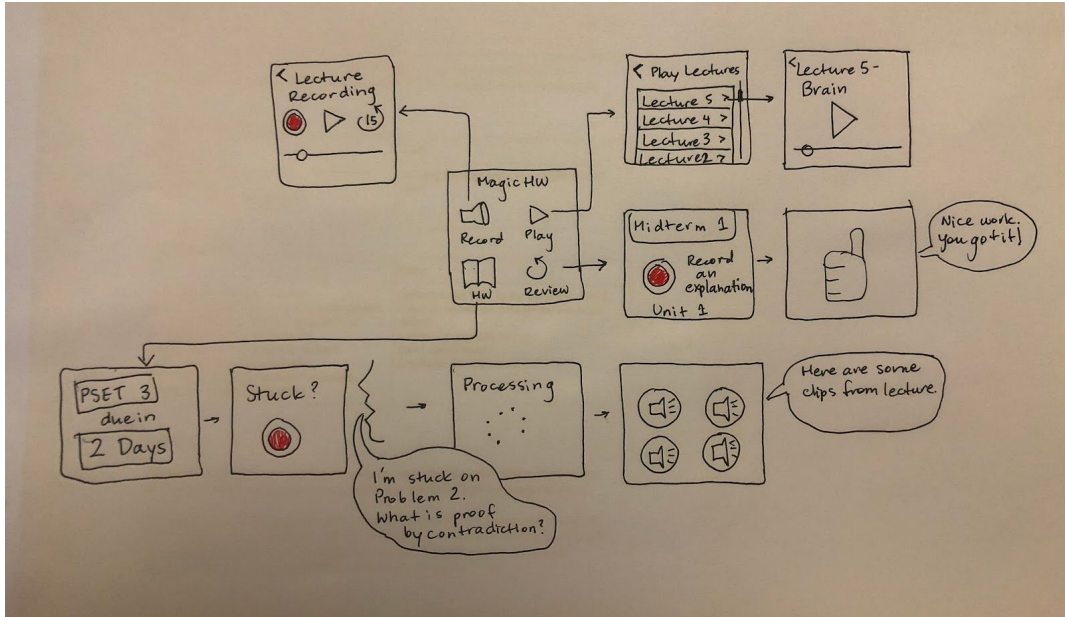
Fig 7.) Wearable interface

Sound is the primary tool in our wearable design: students can record audio of lecture, record their own explanations of course material, and receive voice feedback from the app along the way.

Native phone interface

Pros	Cons
- Easy navigation - Good for visual learners - Many students already have phones - potential for widespread use	- Menu navigation is slow - Relies on existing lecture videos or for the professor to upload lecture videos - Feels less personal

Wearable interface

Pros	Cons
- Clean design, simple task flow - Clear options to choose from at each screen - Personal and engaging voice response feedback - Possibility to record lectures that aren't recorded normally	- Difficult to get back to the top of the menus - Can't do homework on device - Limited functionality options - Emphasis on sound - neglects visual learners - Not all students own wearables - gap in achievement

Reasoning for Selection

Ultimately, we decided on the native phone interface. The emphasis on audio meant that visual learners (of which most of our interviewees were) would not benefit as much. In addition, we felt that it was also important to be able to get from task to task easily, and the small screen size of the wearable device makes it difficult to do so without seriously limiting functionality. That being said, we will use some aspects of our wearable design going forward, such as the use of icons for navigation.

Selected Interface Design
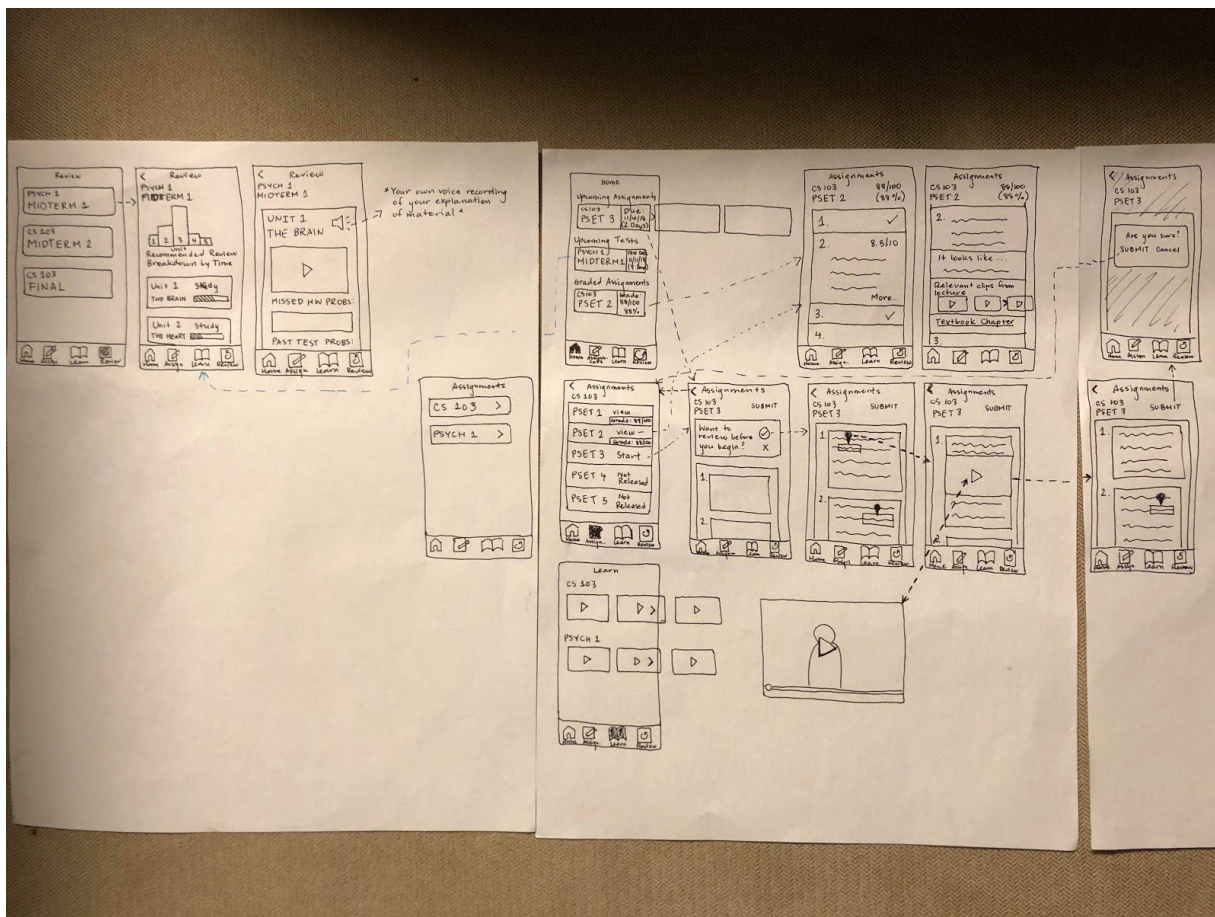
Storyboards for 3 tasks:

Fig. 8) Full Storyboard

We took aspects of our previous ideas to produce the interface above. The functionality and features of our new interface are listed below:

Interface Element	Functionality
Icon bar (under all pages)	Easily navigate between the Home, Assignments, Learn, and Review tabs
Home screen	Access upcoming homework assignments, exams, and recently graded assignments in one place.
Assignments tab	Access all assignments in a course.
Review graded assignments (on Assignments)	Receive personalized corrections on mistakes, relevant video clips from lecture, and relevant textbook chapter for problem.
Highlighted review points (on Assignments)	Key concepts are highlighted. When the highlights are tapped, relevant clips from lecture and lecture slides appear.
Learn tab	Watch all past lecture videos from all courses in one place.
Review tab	Review for an upcoming exam. Organizes exam review according to units/major sections of the course.
Exam analytics (on Review)	Visual representation of recommended time to spend on each unit.
Study/progress bars (on Review)	See how much studying you have done on a particular topic.
Study page (on Review)	Shows lecture videos on topic, past assignment problems that the student got wrong, and practice problems from previous exams.

Prototype

Our prototype was created using index cards and post it-notes and was designed to mimic a phone screen. Users could touch parts of the "screen" to transition to other "screens".

The icon bar at the bottom was removed and attached to each screen that the user found themselves on.

The task flows for each task on our prototype can be seen below -

Task 1 (Simple) -

Find content relevant to an assignment.
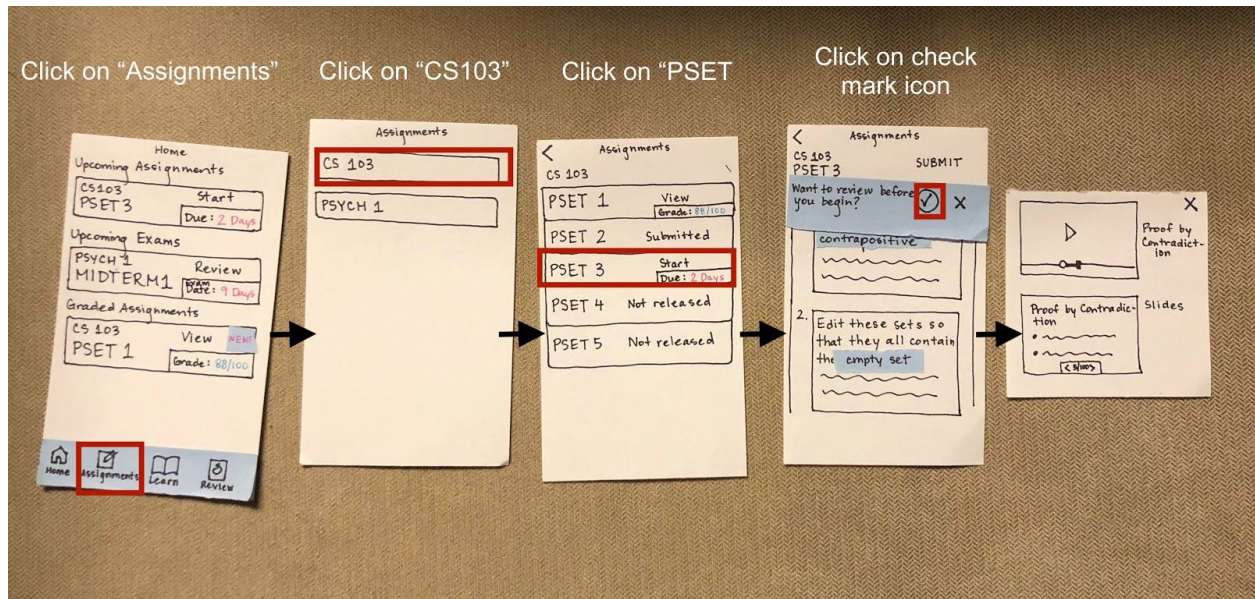

Fig. 9) Task 1

Task 2 (Moderate)

Review questions that the user had gotten wrong in previous assignments.

Fig. 10) Task 2

Task 3 (Complex)

Review relevant material for an upcoming exam.
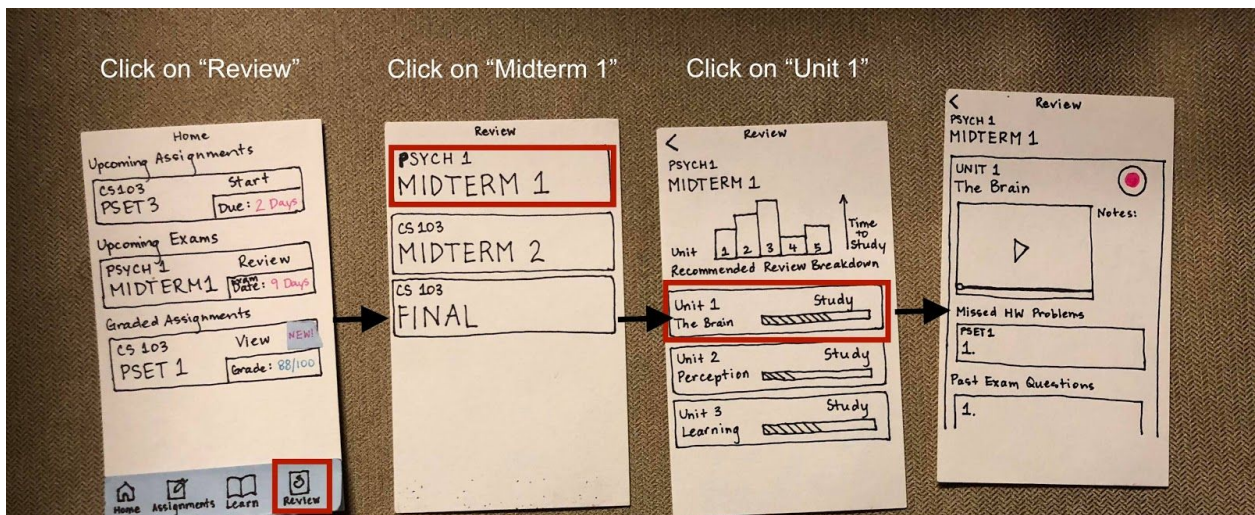
Fig. 11) Task 3

All screens
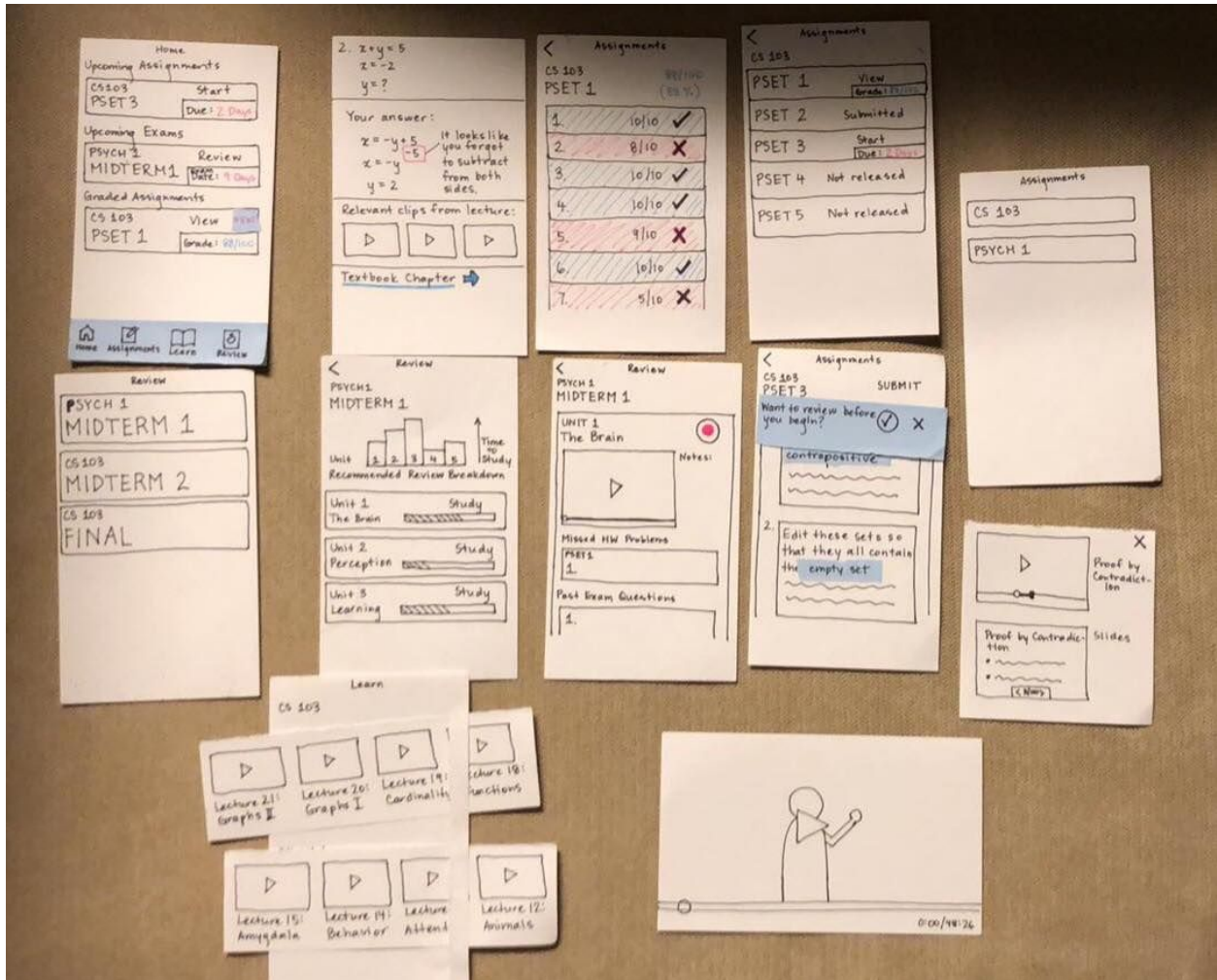
Fig. 12) All prototype screens

Method

Participants

We recruited 5 participants for the study, 4 of which were Stanford students and 1 of which was a working professional.

We received permission from our TA to interview more than 1 student, since our app is most relevant to college students. Since we are trying to provide useful analytics to our users, we had a participant working in analytics try our app and give us feedback. The Stanford students chosen had diverse academic levels (undergrad/co-term/grad) as well as diverse majors.

Our participants were kind enough to donate their time, without any compensation. All the interviews were conducted in the Huang Engineering Building.

Fig. 13) Ryan with prototype setup

Tasks

The participants were given 3 tasks (as outlined in the "Prototype" section)-
- **Task 1**- Find content relevant to an upcoming assignment.
- **Task 2** - Review questions that the user had gotten wrong in previous assignments.
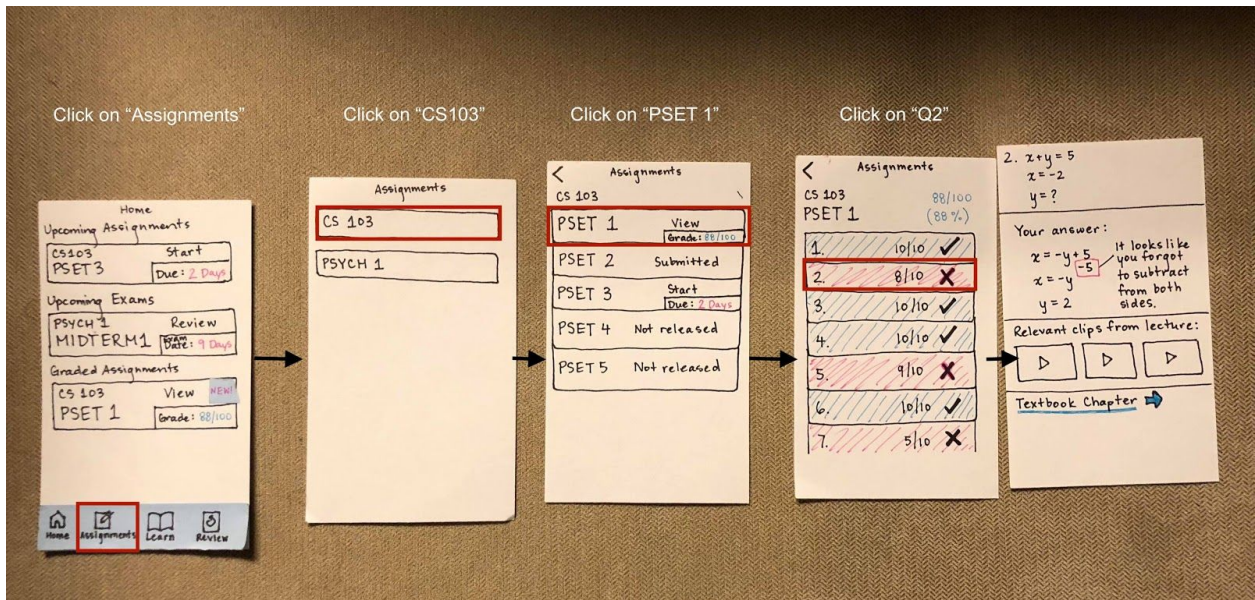- **Task 3** - Review relevant material for an upcoming exam.

Procedure

We followed the following procedure for each participant -
- Give context about MagicHW and tell them how to interact with the prototype ("Pretend this is a phone screen that you can tap on")
- Have them complete each of the three tasks
- Take extensive notes about how the user interacted with the prototype, what the task flow looked like, anything that the user liked/was confused about
- Ask participants for feedback on the prototype

Test Measures

During the experiment, we looked for-

- Time to accomplish each of the tasks
- How participants interacted with the prototype to accomplish the tasks
- Anything that seemed confusing/appealing to the user

Team Member Roles

We had the following roles for the team members-
- **Facilitator** - the team member who explained the experiment and what each of the tasks were
- **Computer** - the person providing the next screen/simulating transitions after each action by the participant
- **Observers** - people taking notes and observing the interactions.

Ryan was the facilitator as well as the computer for the interviews. The rest of the team members were the "observers". They also acted as the participants for practice runs.

Results
- All participants completed each task quickly without many hiccups along the way
- Most did not understand the difference between "Learn" and "Review"
- First instinct for most participants was to click home when receiving new task
- When reviewing a PSet or clicking on an assignment, all participants gravitated towards the ones with poor performance (a wrong answer or a poor grade)
- Participants wanted clarification on how they would submit Psets that were on paper
- Participants wanted more descriptions for each assignment (rather than just "Pset 1, Pset 2, etc..").

Task Timing

	P1	P2	P3	P4	P5
Prepare to begin an assignment	~30 s	~25 s	~2 minutes	~ 25 s	~20 s
Get feedback on a previous assignment	~20 s	~ 30 s	~ 1.5 minutes	~40 s	~25 s
Review for a midterm	~ 25 s	~25 s	~1 minute	~ 35 s	~ 25 s

Discussion

Overall, the testing revealed to us that we are off to a strong start with our application design. Through the generally quick task-completion times, we were able to ascertain that our design was generally very intuitive for a participant with no prior knowledge of MagicHW. A common pattern we discovered was that people's first instinct in completing a task was to click home and go from there. Thus, our "home" button was very well received and the participants enjoyed the summary of information present there.

Additionally, participants really enjoyed the feedback that MagicHW offers, particularly on assignments with poor performances. The participants always gravitated towards to low scores to see their feedback, and it's great that our layout made it possible to find this information quickly.

The "Learn" button provided a pain point for many participants, who claimed that they did not understand the difference between "learn" and "review." They expressed the sentiment that when they review they are learning, and some participants clicked on the "learn" when asked to review for a midterm, although they quickly realized that was not the screen and they switched gears. In order to address this problem, we plan to rename our "Learn" category to "Course Info" or "Course Material" to more clearly differentiate the two tasks.

Some participants pointed out that they forgot what was in different assignments weeks after they are finished, and wanted more information than just the Pset number in the list of assignments. We plan to add a short description for each Pset to make it easier to know what to click.

Our experiment failed to test how MagicHW would integrate into their homework routine (like testing how they would scan their homework). We intend to cover this in our next round of testing.

(1488)

Appendix

The following consent form was given to all participants:

Consent Form

The MagicHW application is being produced as part of the coursework for Computer Science course CS 147 at Stanford University. Participants in experimental evaluation of the application provide data that is used to evaluate and modify the interface of MagicHW. Data will 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 (Samantha Kim, Aarti Bagul, Ryan Ottinger, and Richard Verdin) 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 the MagicHW experiment. I also give permission for images/video of me using the application to be used in presentations or publications as long as I am not personally identifiable in the images/video. I understand I may withdraw my permission at any time

Name _____

Participant Number _____

Date _____

Signature_____

Witness name _____

Witness signature_____

Incident severity ratings

Red text denotes errors, green text denotes successes, yellow is a mix of both

Participant # 1

Incident	Severity

Prepare for pset: clicked on pset 1 → clicks yes to review → "This is sweet" to lectures that pop up	0
"What happens after I leave the lectures? Can I ever access them again?"	2 (not too concerning)
Reviewing for midterm: "What is the difference between learn and review?"	4 (need to fix this issue).
Everything else: Done with absolute ease!	0

Participant #2

Incident	Severity
Prepare for pset: Confused about task, but with clarification clicked on the new assignment → yes to review → watched lecture videos	1
Clicked on Home to start looking at a past assignment, and again before reviewing for a midterm	3
Clicked on assignments tab to look at assignment	2
"What is the difference between the study bar and the chart? Which one do I review?"	2
Everything else went very smoothly	0

Participant #3

Incident	Severity
Get ready for a pset: "There is no description on what the different assignments mean"	4
"The submit button should be at the bottom once an assignment is finished"	3
Looking at past pset: "I really like the way the assignments are laid out and I love that	0

I can see my performance!"	
"What's the class average on these assignments? I want to see how I'm doing with regards to the class."	2
"What's the difference between learn and review"	4
Used the home button to start new tasks and everything else was smooth	3

Participant #4

Incident	Severity
Prepare to start problem set: clicked on course (0) → clicked yes to review (0) → immediately watched videos	0
Task 2: Immediately went home (0) → clicked on graded assignment (0) → clicked on wrong question → "I appreciate seeing feedback on my wrong answer!"	2
Task 3: clicked on review (0) → clicked on class → watched lecture video	0

Participant #5

Incident	Severity
Task 1 : Breezed through it very quickly. No hiccups (0)	0
Task 2: Breezed through it. "Having the chapters is nice"	0
Task 3: "What's the difference between review and learn?" (clicked learn → home → review)	4