clarity

closing the student-teacher feedback loop

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Sherman Leung

clarity

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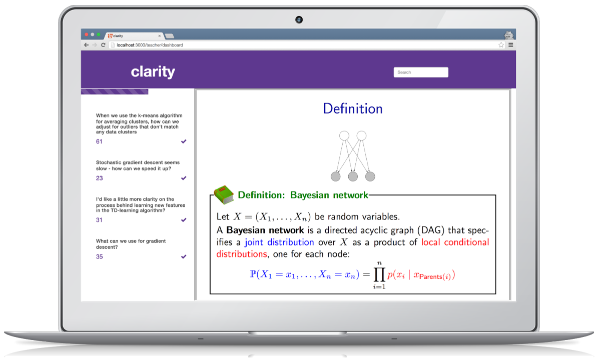
Website: bit.ly/getClarityApp
Hi-fi Prototype: clarityapp.herokuapp.com
ReadMe File: http://bit.ly/1vAt8in

Group Members:
Akaash Nanda: Project Manager
Ari Echt-Wilson: Design
David Eng: Developer
Sherman Leung: Developer

I. Problem and Solution Overview

Clarity encourages more communication between students and professors in large lecture environments. Professors frequently lecture without knowing if students are understanding and questions about material typically come at the end of lecture or not at all. Part of the reason why a teacher's lecturing style seldom improves is because all the feedback they receive is delayed and somewhat "after-the-fact." Like with anything else that requires trial & error to improve, teaching, too, should be rapidly iterative. Some students are afraid to ask questions while others are too overwhelmed by their confusion to even considering interrupting the professor.



When we use the k-means algorithm for averaging clusters, how can we adjust for outliers that don't match any data clusters
61 ✓

Stochastic gradient descent seems slow - how can we speed it up?
23 ✓

I'd like a little more clarity on the process behind learning new features in the TD-learning algorithm?
31 ✓

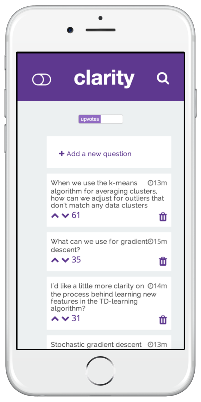
What can we use for gradient descent?
35 ✓

Definition

Definition: Bayesian network

Let $X = (X_1, \ldots, X_n)$ be random variables.
A **Bayesian network** is a directed acyclic graph (DAG) that specifies a joint distribution over X as a product of local conditional distributions, one for each node:

$$\mathbb{P}(X_1 = x_1, \ldots, X_n = x_n) = \prod_{i=1}^{n} p(x_i \mid x_{\text{Parents}(i)})$$



When we use the k-means algorithm for averaging clusters, how can we adjust for outliers that don't match any data clusters 13m
61

What can we use for gradient descent? 15m
35

I'd like a little more clarity on the process behind learning new features in the TD-learning algorithm? 14m
31

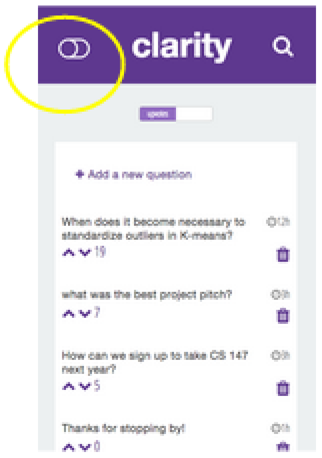
Stochastic gradient descent 13m

A live mobile/web-based interface allowing students to anonymously indicate when material presented by the teacher is unclear and ask questions (refer to the images above) can alleviate confusion and encourage teachers to spend more time/effort on unclear material on the fly. Equipped with this information, a teacher can answer questions, particularly the questions that are causing the most student confusion.

II. Task and Final Interface Solutions

1. Student indication general understanding of material (Simple)
   When students are confused, they do not always have a targeted question to ask the professor. An important task is for students to inform professors of general indication of understanding. The professor ought to know how much of the class is understanding and how helpful answers to a question are. We wanted to gauge a higher level of understanding in addition to more specific questions.

   Clarity's solution for this task is the Clarity toggle in the top left of the student app and the understanding bar at the top of the professor interface. When students are understanding material, the toggle is turned on (Figure 2). As soon as they become confused, they update the toggle by turning it off (Figure 1). The bar at the top of the professor interface (Figure 3) shows the percentage of students using the app who have are currently understanding, or have the toggle on.



When does it become necessary to standardize outliers in K-means?
19

what was the best project pitch?
7

How can we sign up to take CS 147 next year?
5

Thanks for stopping by!
0

Figure 1. Not understanding

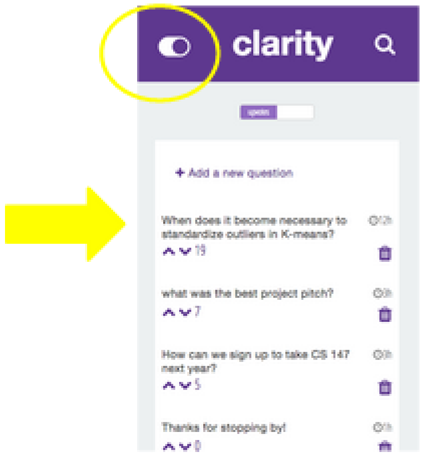


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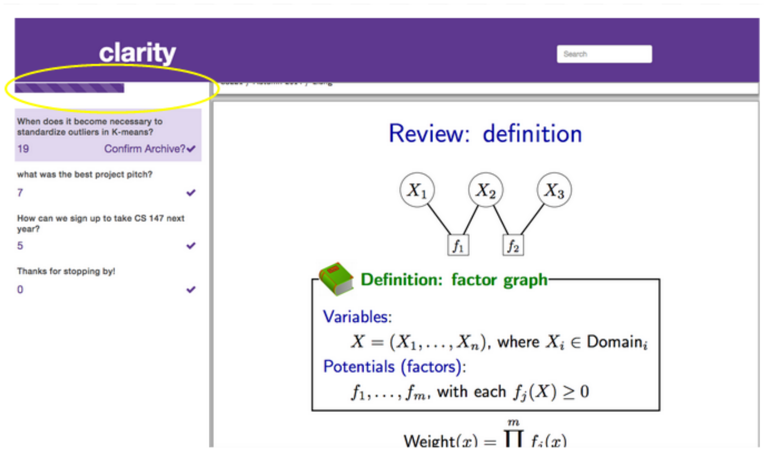
Figure 2. Understanding



When does it become necessary to standardize outliers in K-means?
19 Confirm Archive?

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0

Review: definition

Definition: factor graph

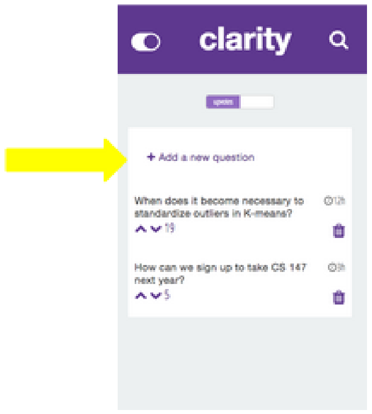
Variables:
$X = (X_1, \dots, X_n)$, where $X_i \in \text{Domain}_i$

Potentials (factors):
$f_1, \dots, f_m$, with each $f_j(X) \geq 0$

Figure 3. Professor Understanding bar

2. Student asking a specific question (Complex)
   The most common way students remedy their confusion is by asking questions. However, in the traditional lecture environment, this can be difficult. Students have to interrupt lecture by raising their hand or wait until after lecture when they may be more confused as a result or the material is not as fresh. In addition, students are often uncomfortable asking questions in lecture and are unsure if anyone else is confused about the same material.

   Clarity's solution is online forum for students to ask questions real-time in lecture. In addition, questions are anonymous and the quality is crowd-sourced by other students. Student questions appear live on the the student feed as well as the professors.



When does it become necessary to standardize outliers in K-means? 12h
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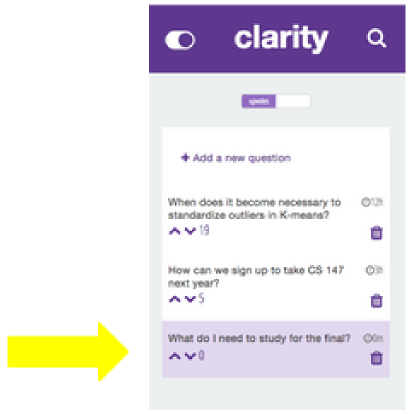
How can we sign up to take CS 147 next year? 3h
5



When does it become necessary to standardize outliers in K-means? 12h
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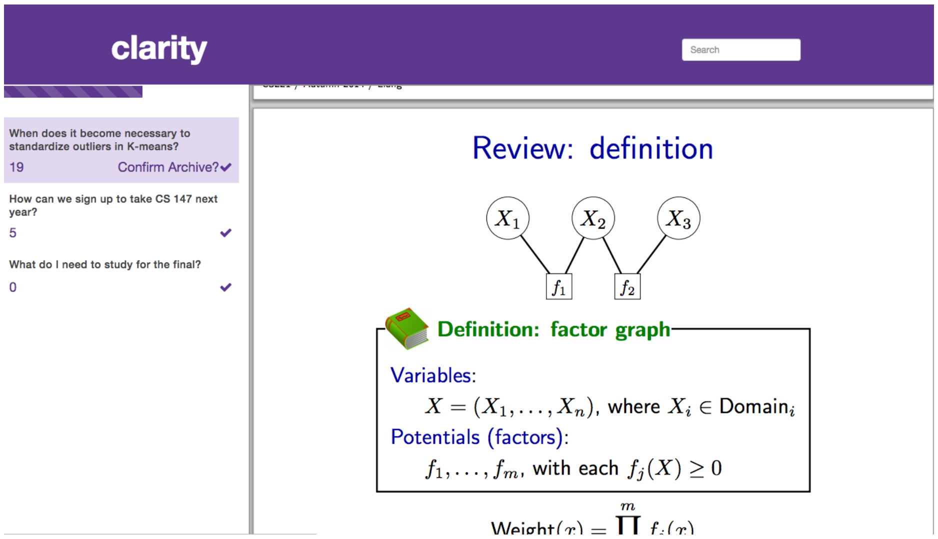
How can we sign up to take CS 147 next year? 3h
5

What do I need to study for the final? 0m
0

Figure 4. Adding a Question

Figure 5. Question added


clarity

Search

When does it become necessary to standardize outliers in K-means?

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How can we sign up to take CS 147 next year?

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What do I need to study for the final?

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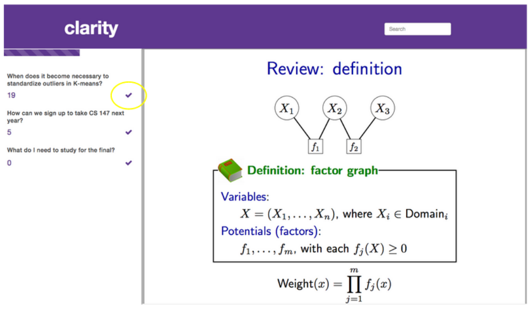
$\text{Weight}(x) = \prod_{j=1}^{m} f_j(x)$

Figure 6. Question added on Professor Interface

3. Professor addressing a student question (Moderate):
After a student asks a question in lecture, the professor has the opportunity and responsibility to answer it. As such, our third and final task is the professor answering a question.

   Our interface solution is that when a professor answers a question, they archive it from their interface and this is mimicked on the student interface as well. A professor has to click the question mark (depicted in Figure 7) and confirm the archive (Figure 8). Afterwards, the question disappears from the feeds (Figure 9), clearing up the space for new questions that students can seek Clarity on.


clarity

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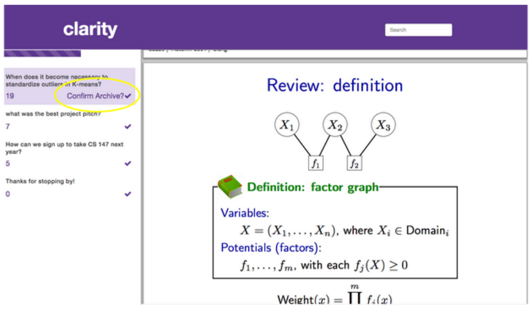
clarity

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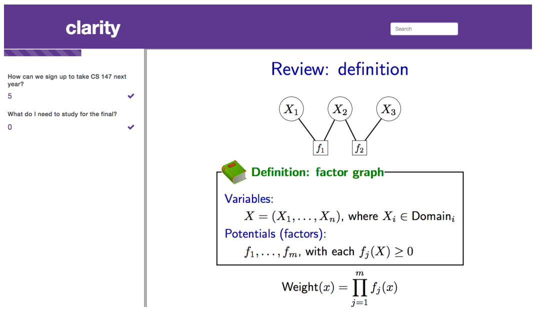
Figure 7. Archiving a question

Figure 8. Confirm Archive



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$$\text{Weight}(x) = \prod_{j=1}^{m} f_j(x)$$

Figure 9. Question removed from feed

III. Major Usability Problems Addressed

Below are the results from our Heuristic Evaluation. Below each violation is our reasoning and changes in italics.

[H2-10 Help and documentation] [Severity: 4]
Reason: [Student UI] The interface features a light bulb button for users to tap on to signal their understanding of lecture material (according to the write-up). However, there is no information on the screen to help users understand what the button is used for.

We chose to replace the lightbulb with toggle switch and explain its use in the ReadMe file in order to prevent users from getting confused.

[H2-8 Aesthetic and minimalist design] [Severity: 3]
Reason: [Student UI] Tapping the light bulb button changes the color of the button as well as the title label (“CLARITY”). Changing color of the title label is redundant and unexpected.

We took this violation into consideration and replaces the light bulb with a toggle, clearly indicating to the user whether or not it was enabled. This eliminated the need for a label altogether and addressed the redundancy this violation raised.

[H2-3 User control and freedom] [Severity: 5]
Reason: [Student UI] When users starts a new question, there is no obvious way to exit/cancel out of the process.

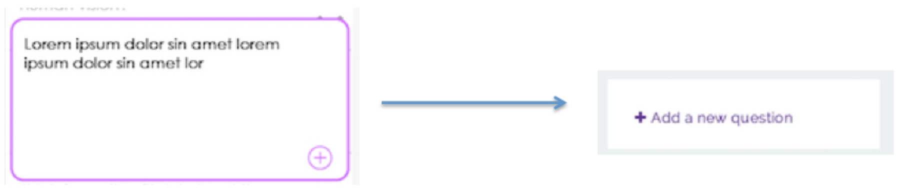
The “Add Question” feature is now an embedded function in the home screen of the mobile interface. There is no need to exit or cancel the process beyond simply continuing to use the interface for an alternate function.

[H2-4 Consistency and standards] [Severity: 3]
Reason: [Student UI] The virtual keyboard for inputting a new question is missing the “return” button. In its place is an unexpected “add” button.

Though this was a true in our medium-fidelity prototype, the keyboard will (of course) depend on the mobile operating environment Clarity is being used in. In other words, the keyboard will vary based on the default keyboard preferences of the user. Clarity, as an application, will not have a unique keyboard. Therefore, no design change was made.

[H2-10 Help and documentation] [Severity: 3]
Reason: [Student UI] There is an “add” icon on the bottom right of the question text input box.

Not too sure how to interpret this violation, but we simplified this task by making the instructions in where to add a question even more explicit. Users know exactly where to tap to add a new question.

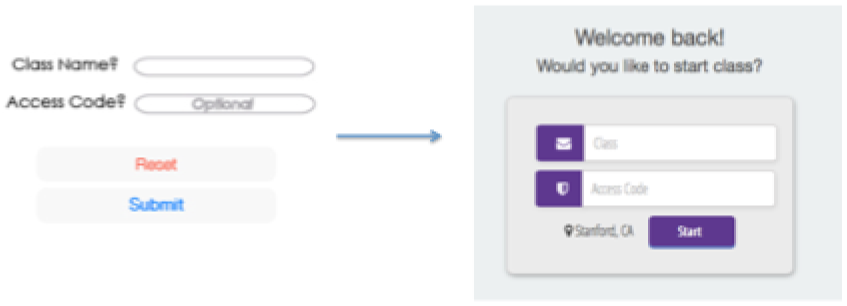


[H2-8 Aesthetic and minimalist design] [Severity: 4]
Reason: [Student UI] The question text input box uses only a small portion of the available screen space. This makes it hard to input longer questions and there is no need to show partial views of older questions while the user is inputting a new question.

The text input field is now dynamic and changes with the length of the question. This should no longer limit the user on how much of their question they can see in a single few, regardless of question length.

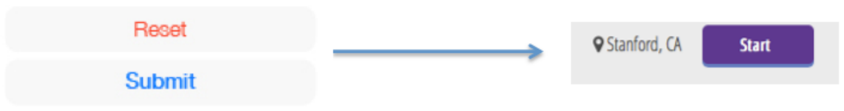
[H2-4 Consistency and standards] [Severity: 3]
Reason: [Professor UI] The use of question marks in “Class Name” and “Access Code” inputs is unconventional. Most websites use “:” instead of “?”.

The professor UI has a redesigned interface simply asking professors to sign in and begin. This is a stark departure from the initial professor login page involving some of the syntactical flaws this violation referred to.



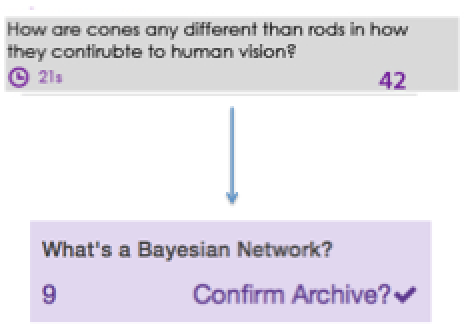
[H2-2 Match between system and the real world] [Severity: 3] [Found by A, B]
Reason: [Professor UI] The interface asks “Would you like to start class?” Yet the possible choices of actions are either “Submit” or “Reset”, neither of which answers the question.

This violation was addressed by changing the syntax of these buttons. The concern was valid. The new interface button text is far more sensible and direct.



[H2-10 Help and documentation] [Severity: 5]
Reason: The interface uses double click to remove an open question (according to the write-up). However, there is no information on the screen to help users understand this usage model.

The new professor interface is quite clear in how to remove a question. The professor can highlight a question while they address and then then simply click on the checkmark in order to confirm and clear the question from the queue. They are guided with text through this intermediary step.


How are cones any different than rods in how they contirubte to human vision?

21s

42

What's a Bayesian Network?

9

Confirm Archive?✓

[H2-7 Flexibility and efficiency of use] [Severity: 5]
Reason: [Professor UI] Questions are sorted by votes. Users may want to sort by post time or by poster. For example, sorting by post time avoids the display of stale questions.

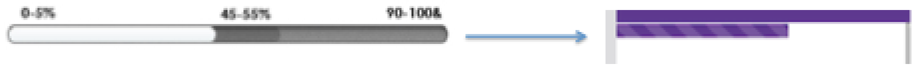
We chose to ignore this violation because we firmly believe that professors should not be overwhelmed with sorting options and should instead only be presented with questions in the order of their prominence in class. In other words, we give professors the option to mange the question feed by clearing questions, but no struggle with the sorting of the questions.

[H2-10 Help and documentation] [Severity: 3]
Reason: [Professor UI] Single click of an open question changes the associated cell's background color to grey. Yet there is information available to the user as to what this signifies.

The student is now given knowledge as to what this highlight means in the ReadMe file as part of their onboarding into the Clarity system. Further, the student cannot initiate the highlight himself or herself-- it is solely a power that the professor can use as they address a question.

[H2-10 Help and documentation] [Severity: 4]
Reason: [Professor UI] The "Student Understanding" progress bar shows multiple values (one indicated by a white bar, another by a dark grey bar). There is no information available to the user as to what is the difference between the two values.

The Clarity bar has now been revised to be a single dynamic purple bar indicating understanding within the classroom. There are no numbers attached and instead serves the purpose of a quick visual tool for the professor to seamlessly survey the class.



[H2-6 Recognition rather than recall] [Severity: 4]
Reason: [Professor UI] Users have to recall and manually input the class name for the application to start. This is taxing the users' memory load.

We chose to ignore this violation because it was the result of a misunderstanding of our product's function by the evaluator. The professor does not have to enter the class name precisely in order to start class, the professor will automatically be logged into the class that he/she is teaching based on the professor's location and the class's time.

[H2-2 Match between system and the real world] [Severity: 3]
The light bulb and logo have no evident relationship with each other. Why should toggling one also toggle the other? There's no precedent for this in any other system or in the real world.

This violation has been addressed by eliminating the lightbulb logo and uncoupling it with the logo. Instead, we introduced a toggle that indicated Clarity and have left it independent of any other design changes upon activation.

[H2-1 Visibility of system status] [Severity: 4]
The slides on the professor's screen don't seem to be controllable using standard slide controls. What if the professor scrolls to the wrong place accidentally? They'll have to spend precious seconds in the middle of the lecture getting their bearing again.

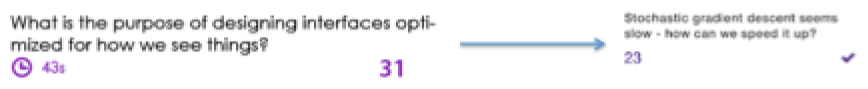
This was a shortcoming of our prototyping tools. Ideally, in the final implementation of our design, the presentation component of the professor view is an embedded pdf slideshow with the intention of eventually including opportunities to plug in other presentation software (e.g. PPT, Keynote, or Google Slides)

[H2-6 Recognition rather than recall]* [Severity: 4]
In the student screen, posting a question doesn't then jump you to the newly posted question.

We chose to ignore this feedback because our user tests revealed students preferred to see questions that were most pressing in the entire classroom rather than follow their own. They thought a notification system to keep track of their own posted questions would be a smarter way to handle updates rather than directing their attention to their question and their question alone.

[H2-4 Consistency and standards] [Severity: 3]
Clarity displays the net votes for a question differently in student and teacher modes. For the student, that number is situated between the upvote and downvote arrows, invoking a pattern seen in Reddit and other services. But for the teacher, it's awkwardly placed under the question, connoting nothing -- it's just a number, sitting there.

This was a valid concern and one that we addressed in our updated design. Our new professor interface has the vote count situated in a similar position relative to the question as the student mobile interface does.


What is the purpose of designing interfaces optimized for how we see things?
43s
31
Stochastic gradient descent seems slow - how can we speed it up?
23

[H2-1 Visibility of system status]* [Severity: 4]
How does the professor see comments on a question? Clicking a question in professor mode on the prototype just selects it; it doesn’t show questions.

(See the note on commenting in Prototype Implementation) We were not able to implement the commenting function in our hi-fi prototype because the development time it would have required wouldn’t have fit within the time constraints. However, we recognize that this is a concern and if we had implemented commenting, the professor would have been able to view it by clicking on the question.

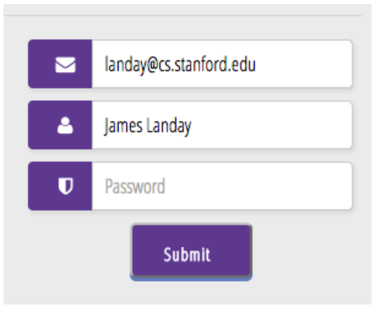
[H2-1 Visibility of system status] [Severity: 4]

The interface, both teacher and student, gives the viewer no way to tell how many comments have been posted for some question -- until they click on the question. Comments are a guessing game, invisible unless you are already reading the question.

(See the note on commenting in the prototype implementation) Again, a very good point that ought to be fixed. We were not able to implement the commenting function in our hi-fi prototype because of technical obstacles. However, as soon as commenting is implemented, we would add a label below the question indicating the number of comments for students to view.

[H2-9 Help users recognize, diagnose, and recover from errors] [Severity: 3]
The purpose of the Reset button on the teacher login screen is not clear.

The reset problem was removed for this reason. Now, professors sign up using "Submit" before setting up class.



[H2-10 Help and documentation] [Severity: 3]
What is the gear with the 'i' in the top-left corner of the student screen? Is that help or settings or
additional information?

We removed the settings button (the gear with the 'i') because we did not see a true need for settings. In addition, this keeps the app consistent with a very simple interface design that does not, at the time, have a need for settings.

[H2-8 Aesthetic & Minimalist Design] [Severity: 5]
Problem: The purple and pink color scheme is distracting and displeasing to the eye.

Violation: High-saturation colors directly next to each other are jarring for our eyes; I find this to be the case with the saturated purple and pink colors with interposing white text.

In our hi-fi prototype we desaturated the purple, making it less bright, and little more blue in hue. In addition, we didn't use shades of the purple, but kept exactly three colors: purple, black, and white. It is our hope that this combination is more pleasing and makes the interface less distracting.

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[H2-2 Match Between System & Real World] [Severity: 4]
Problem: When I clicked on the question, I found it surprising that it just expanded downwards, showing comments, and was confused at first; I thought it didn't work.
Violation: I think this violates the typical user's expectation that clicking on a question will take us to a separate question page à la Stack Overflow.

The technical challenges of implementing commenting on questions involved a nested model structure that we simply didn't have time to incorporate into a data model. Rather than just adding metadata, the associations between the comments and the questions would involved a more complex schema that would have each required a socket listener to update across multiple devices. Though the developers recognized the importance of this feature, it was decided that it was more worthwhile to focus on the design and the user experience of the other main functionalities of the application.

[H2-2 Match Between System & Real World] [Severity: 5]
Problem: There's no way at all for students or professors to post answers to the questions.
Violation: In the real world, questions are always accompanied by answers, not just comments. It's counter-intuitive to not have an "answer this" button.

The idea for the application is to have students use the application in lecture, real-time. Therefore, the answers to the questions are answered within the lecture *itself. This is what distinguishes our application from sites like Piazza. We have talked about eventually wanting the application to be able to archive questions and allow answers from students, TAs, or professors. However, in its essence, we want the application to remain an in-lecture tool. Allowing answers would take more time away from the lecture from students and professors, an effect we want to avoid.*

[H2-1 Visibility of System Status] [Severity: 5]
Problem: When I clicked the light bulb, I couldn't tell that anything had happened until I hit back and tried it a few more times, at which point I noticed a yellow color change.
Violation: The change of system status isn't easy to see, so I have difficulty identifying the system's status at a given moment without looking closely.

We changed this design in our lecture by indicating understanding through a switch rather than through color. Rather than using color, we have a very literal toggle switch and hope that this improves this heuristic violation.

[H2-2 Match Between System & Real World] [Severity: 5]
Problem: Why call it an "access code" when it's actually a password?
Violation: Access code is a non-standard terminology that gave me pause; it's unnecessarily confusing I think.

In fact, this is not actually a password, which is why we named it an access code. We did not want it to be confusing terminology and tried to avoid it. The access code is for the professor to control which students are using the application and avoid intrusions from students in other classes nearby.

[H2-4 Consistency & Standards] [Severity: 3]
Problem: The access code / password is optional but it doesn't look optional.
Violation: It's confusing to me that what looks like a username / password login has a password
equivalent marked optional. I've never really seen that before.

We remedied this violation by removal the “optional” part of it. It is no longer optional in the hi-fi prototype.

[H2-10 Help & Documentation] [Severity: 3]
Problem: On the professor’s end, there does not appear any way to go to settings or help.
Violation: Regardless of the situation or simplicity, there should generally be a way to access help, documentation and settings, which there isn’t in this case.

We wanted to keep the interface as simple as possible. As we were building it, we could not think of what information would be in settings. The application is so simple and has very little interaction, so less documentation is required. Perhaps, as the app progressed, there would become a need for this function and it would need to be added. For now, though, we are keeping this piece out.

[H2-3 User Control & Freedom] [Severity: 4]
Problem: Again on the professor’s end, there does not seem to be any way to change the class’ settings or remove questions, diminishing control.
Violation: The professor simply needs to have control over more than he/she currently does. Inability to change class settings, sort and remove questions is paralyzing.

In fact, in our medium-fi prototype, a professor removed a question by double clicking on it as was described in the ReadMe file. However, in the hi-fi prototype, we made this functionality more apparent by including a check mark button. When a question is answered in class, the professor can click the check mark and confirm the archive, removing the question and clearing up the feed.

[H2-5 Error Prevention] [Severity: 4]
Problem: When entering a question, there is no way to tell if it has already been asked.
Violation: Because most users would not scroll all the way to the bottom to look at every question, there is the risk of duplicate questions, which dilutes upvoting and is essentially an error.

We try to remedy this violation by including a search bar, where students can perform a keyword search to find similar questions. Other than including some form of machine learning or language analysis, this is the best way we could think of trying to prevent duplicate questions. How severe this problem would be *would become most clear after seeing how many questions are actually asked in lecture.*

IV. Design Evolution

For the design of Clarity, we really focused on simplicity and accessibility, because through interviews and testing our project, one of the primary concerns was that an in-lecture application would be distracting. We wanted to minimize distractions and keep the focus off Clarity, and on the lecture at hand. We conducted several interviews using the master-apprentice model to learn how people behaved in lecture. We learned that a lecture is a very unique experience for individuals, students as well as teachers, and as a result we came up with several initial ideas.

Our first sketches of the design (Figure 10) were inspired by the mobile app Yik Yak, for the purpose of crowdsourcing question quality by students upvoting and downvoting other questions.

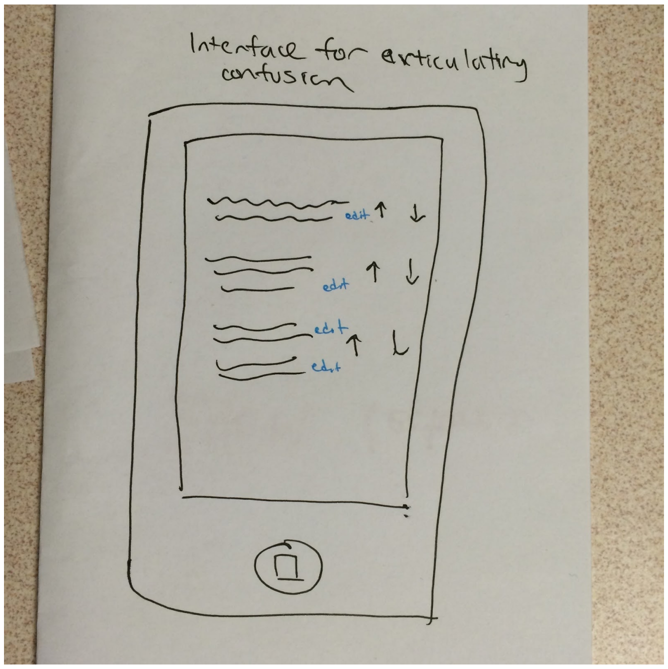


Figure 10. First Clarity design sketch

After deciding on this general principle, we explored the options further and started thinking about, and sketching out, what some of the screens might look like and what students and teachers might be able to do with an application such as this one. Figure 11 shows our initial ideas for students showing their understanding. Notice how it involves multiple screens and using the literal phrase “Got it!” for the button. The initial idea was kept through all iterations, but the design drastically changed.

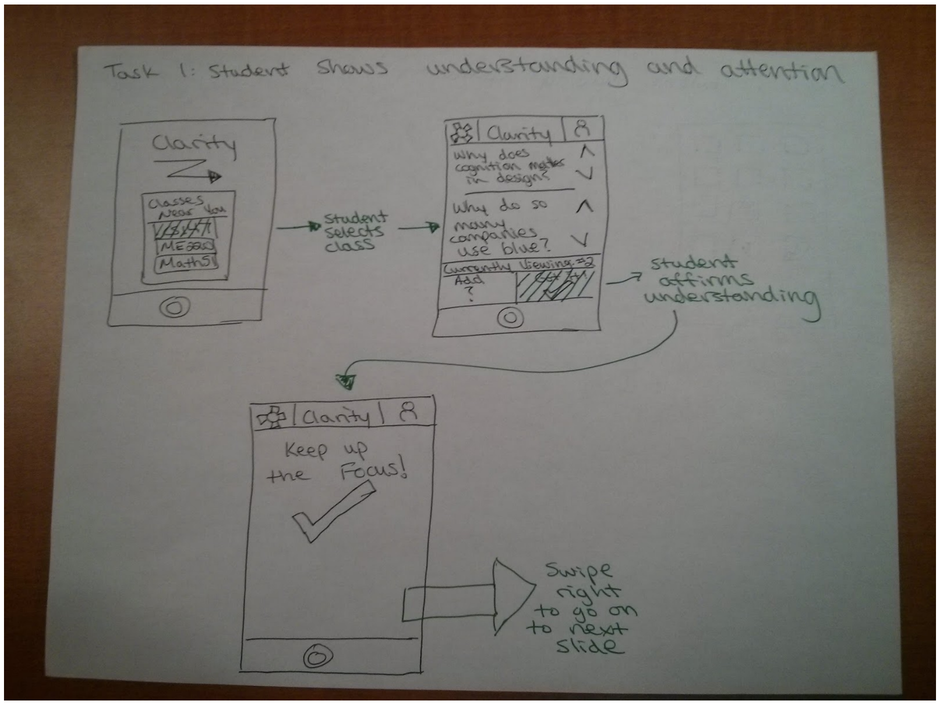

Task 1: Student shows understanding and attention
Clarity
Classes Near You
ME330
Math51
student selects class
Clarity
Why does cognition matter in design?
Why do so many companies use blue?
Currently Viewing #3
Add ?
student affirms understanding
Clarity
Keep up the Focus!
Swipe right to go on to next slide

Figure 11. Clarity button initial idea

Initially, we also had a more complicated professor interface. In addition to the question feed, this storyboard (Figure 12) had a section for more complex analytics and prompting to the professor. We simplified this because we wanted Clarity to be the background for the lecture, not trying to take it over. We simply want more communication between students and professors, and we do not want too many flashy tools in the way. Rather than the graphs and key words for student attention, we developed this into the simple Clarity bar of understanding (see in Figure 23).

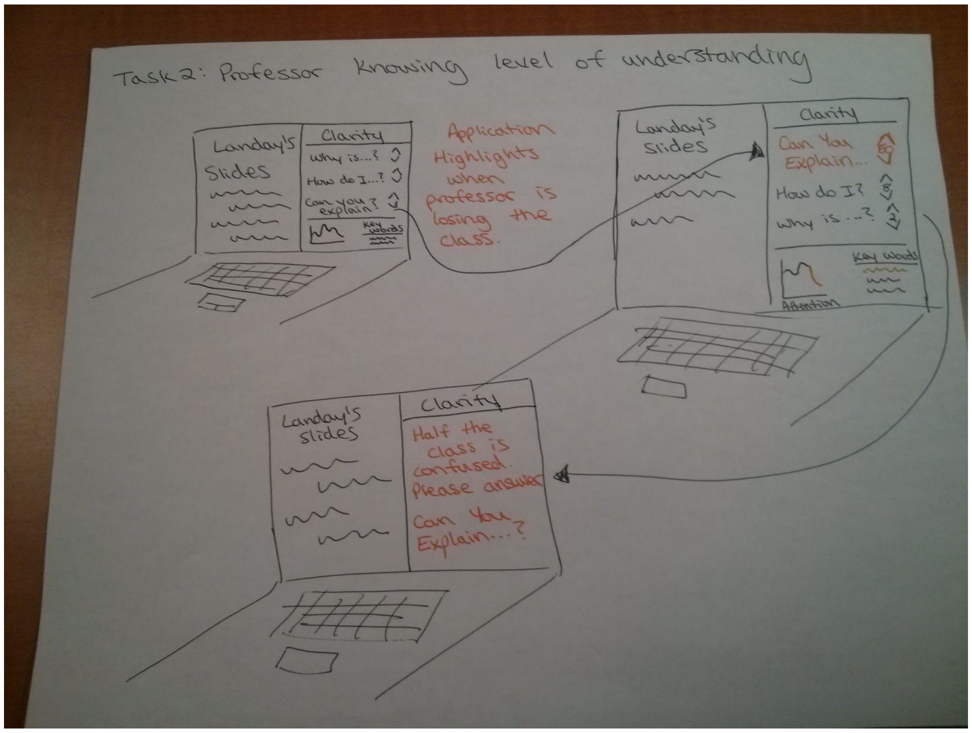

Task 2: Professor knowing level of understanding
Landay's Slides
Clarity
Why is...?
How do I...?
Can you explain?
Key words
Application Highlights when professor is losing the class.
Can You Explain...
How do I?
why is...?
Key words
Attention
Half the class is confused. Please answer
Can You Explain...?

Figure 12. Professor initial storyboard idea

Finally, for asking a question, our first ideas included more screens and involvement with the application. Students click “add a question,” the go to another screen, and back to the home screen (Figure 13). In our final designs we kept this all on one page and cleaned up the interaction where students just tap the text box.

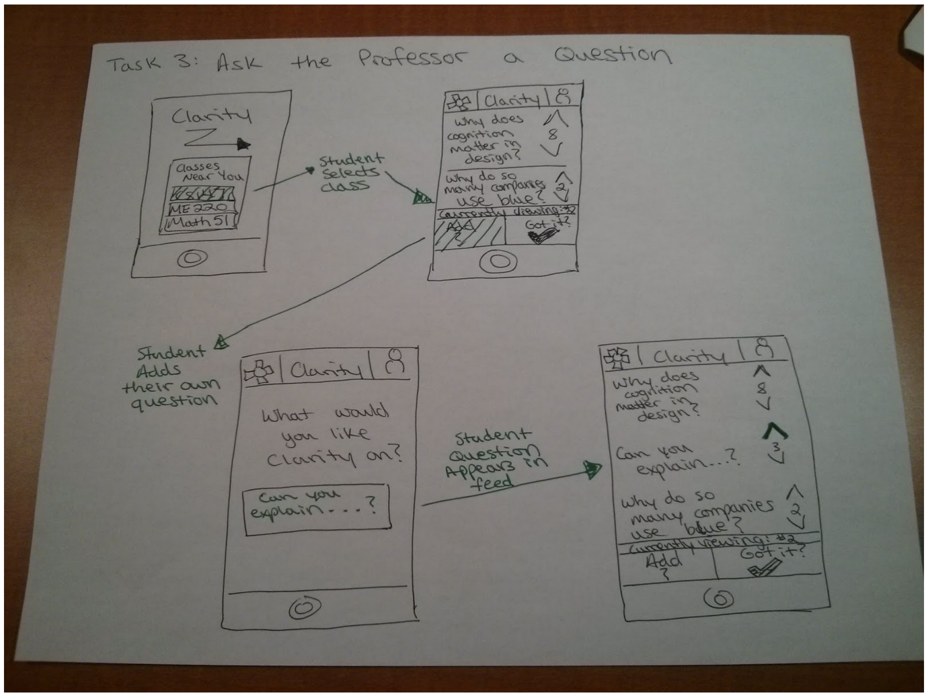
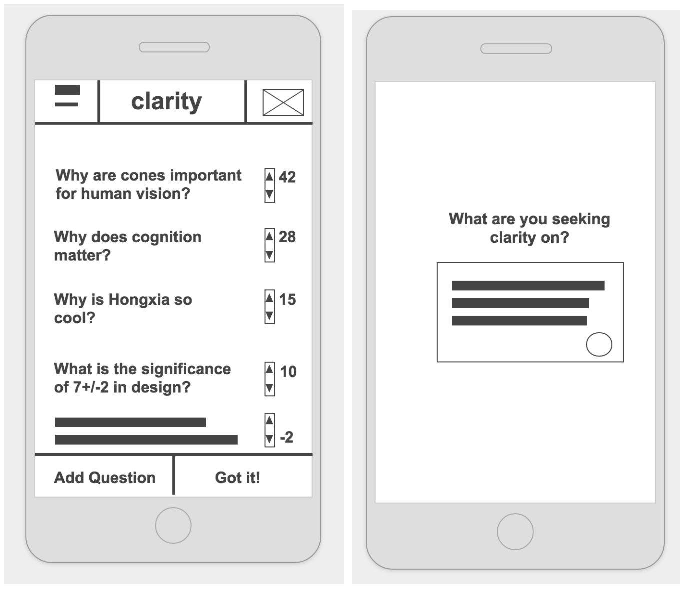
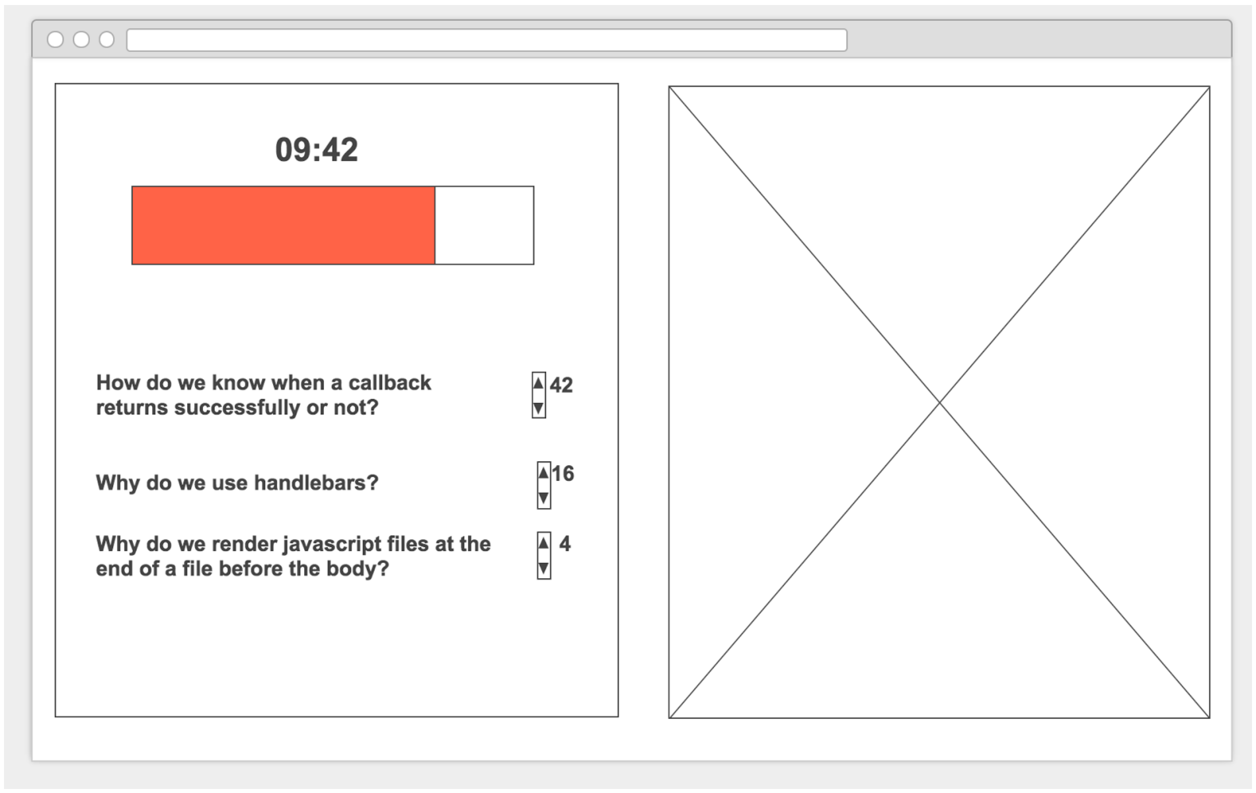

Task 3: Ask the Professor a Question
Clarity
Classes Near You
ME220
Math 51
Student selects class
Clarity
Why does cognition matter in design?
8
Why do so many companies use blue?
2
Currently viewing: #2
Got it?
Student Adds their own question
Clarity
What would you like Clarity on?
Can you explain...?
Student Question Appears in feed
Clarity
Why does cognition matter in design?
8
Can you explain...?
3
Why do so many companies use blue?
2
Currently viewing: #2
Add ?
Got it?

Figure 13. First idea for adding a question task

We took our storyboard sketches and turned them into our low-fi prototype (Figure 14 and 15). This prototype is in grayscale and the images are taken from the prototyping app used to make it. We used this to primarily get ideas about how an app like this might work in a classroom and how its tasks should be implemented. The usability testing proved very informative for how to improve the design. Students and professors really did not want the application to be distracting in the class. In addition, some of our phrasing was confusing, like "got it" for a button, so we knew we had to improve upon that concept. After the testing, it was time to move on to a more polished design for the app.


clarity
Why are cones important for human vision?
42
Why does cognition matter?
28
Why is Hongxia so cool?
15
What is the significance of 7+/-2 in design?
10
-2
Add Question
Got it!
What are you seeking clarity on?
Figure 14. Low-fi Clarity Student Prototype


09:42
How do we know when a callback returns successfully or not?
42
Why do we use handlebars?
16
Why do we render javascript files at the end of a file before the body?
4
Figure 15. Low-fi Clarity Professor Prototype

Our medium-fi prototype introduces color as well as a cleaned up design to get a better feel for how the app would actually look and feel. We used illustrator to create mockups for the design and link them together with Marvel, a prototyping app. We chose purple because it is a cool color, relaxing and calming (we did not want to add more intensity to the lecture environment), and because it was the complementary color to yellow, which we were going to use to highlight the Clarity button, which indicates student understanding. The Clarity button (Figure 16) changed so that while students are understanding, it is turned on (highlighted yellow), and turns off when they are not. This is also why we chose the lightbulb icon. In addition, we got rid of the multiple screens for asking a question and also added the ability for students to comment on a given question (Figure 17).

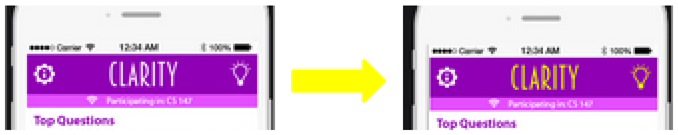
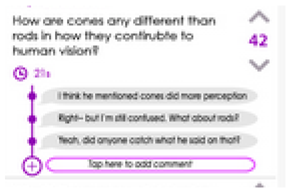


Figure 16. New Clarity button


How are cones any different than rods in how they contribute to human vision?

42

21s

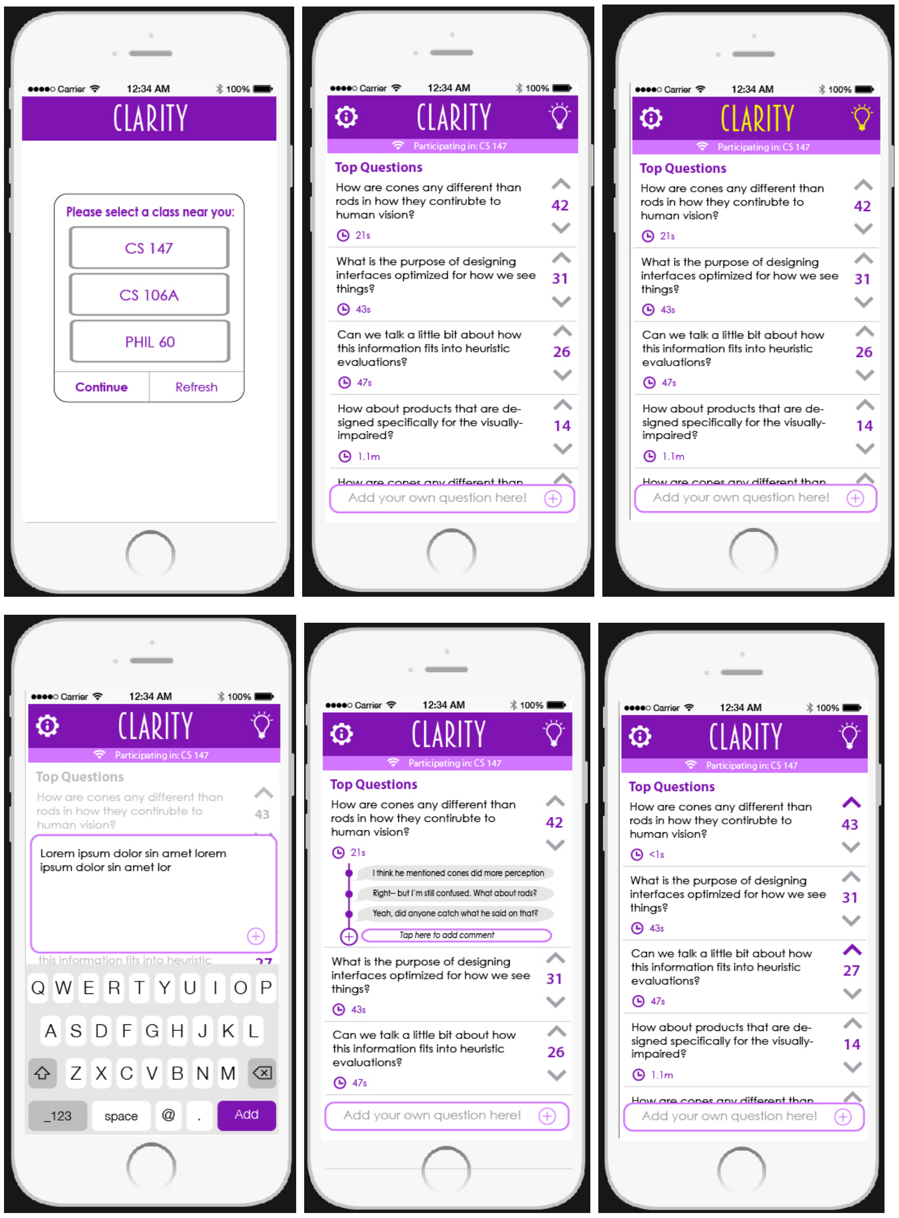
I think he mentioned cones did more perception

Right– but I'm still confused. What about rods?

Yeah, did anyone catch what he said on that?

Tap here to add comment

Figure 17. Commenting on a question


●●●●○ Carrier 12:34 AM 100%

CLARITY

Please select a class near you:

CS 147

CS 106A

PHIL 60

Continue Refresh

●●●●○ Carrier 12:34 AM 100%

CLARITY

Participating in: CS 147

Top Questions

How are cones any different than rods in how they contirubte to human vision? 42 21s

What is the purpose of designing interfaces optimized for how we see things? 31 43s

Can we talk a little bit about how this information fits into heuristic evaluations? 26 47s

How about products that are de-signed specifically for the visually-impaired? 14 1.1m

How are cones any different than

Add your own question here!

●●●●○ Carrier 12:34 AM 100%

CLARITY

Participating in: CS 147

Top Questions

How are cones any different than rods in how they contirubte to human vision? 42 21s

What is the purpose of designing interfaces optimized for how we see things? 31 43s

Can we talk a little bit about how this information fits into heuristic evaluations? 26 47s

How about products that are de-signed specifically for the visually-impaired? 14 1.1m

How are cones any different than

Add your own question here!

●●●●○ Carrier 12:34 AM 100%

CLARITY

Participating in: CS 147

Top Questions

How are cones any different than rods in how they contirubte to human vision? 43

Lorem ipsum dolor sin amet lorem ipsum dolor sin amet lor

this information fits into heuristic 27

Q W E R T Y U I O P

A S D F G H J K L

Z X C V B N M

.123 space @ . Add

●●●●○ Carrier 12:34 AM 100%

CLARITY

Participating in: CS 147

Top Questions

How are cones any different than rods in how they contirubte to human vision? 42 21s

I think he mentioned cones did more perception

Right– but I'm still confused. What about rods?

Yeah, did anyone catch what he said on that?

Tap here to add comment

What is the purpose of designing interfaces optimized for how we see things? 31 43s

Can we talk a little bit about how this information fits into heuristic evaluations? 26 47s

Add your own question here!

●●●●○ Carrier 12:34 AM 100%

CLARITY

Participating in: CS 147

Top Questions

How are cones any different than rods in how they contirubte to human vision? 43 <1s

What is the purpose of designing interfaces optimized for how we see things? 31 43s

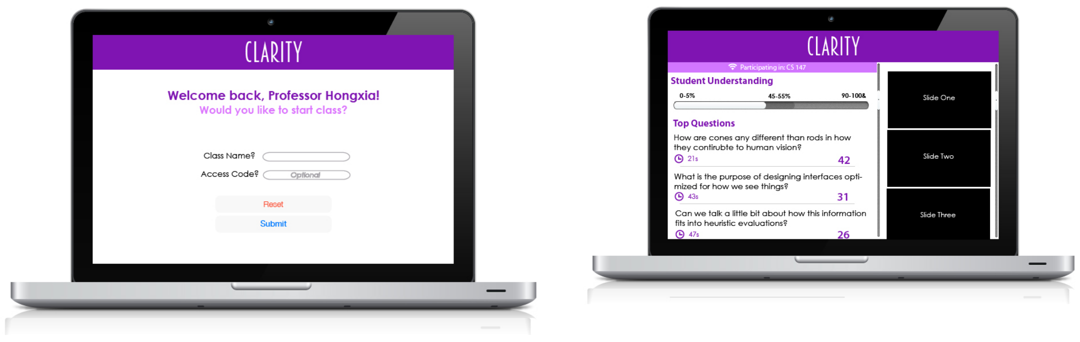
Can we talk a little bit about how this information fits into heuristic evaluations? 27 47s

How about products that are de-signed specifically for the visually-impaired? 14 1.1m

How are cones any different than

Add your own question here!

Figure 18. Medium-fi Student Interface Screens



Welcome back, Professor Hongxia!
Would you like to start class?

How are cones any different than rods in how they contirubte to human vision?
21s 42

What is the purpose of designing interfaces optimized for how we see things?
43s 31

Can we talk a little bit about how this information fits into heuristic evaluations?
47s 26

Figure 19. Medium-fi Teacher Interface Screens

For our final Hi-fi prototype we took into account what feedback we got from the Heuristic Evaluation (see previous section above). The key design changes included desaturating the color and keeping the design to three colors (purple, black, and white). We focused on improving functionality and getting the app running connected to the professor interface. We also further improved the clarification of certain features, such as the clarity button (Figure 20) and removing questions on the professor interface (Figure 21).

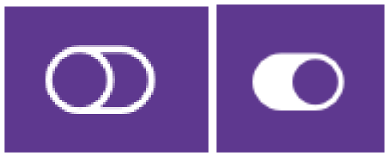
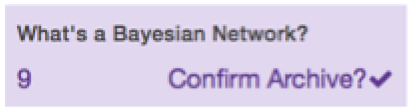
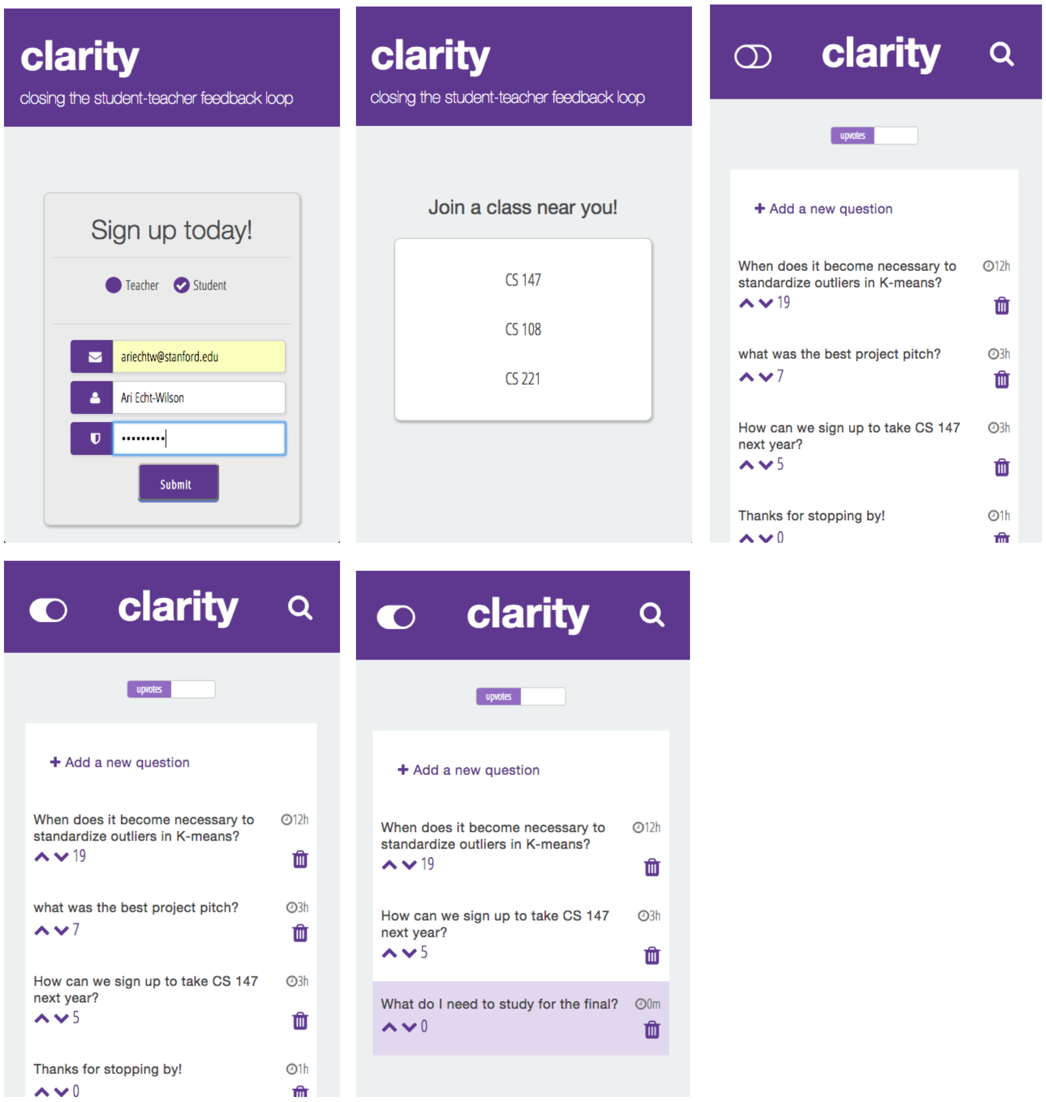


Figure 20. Improved Clarity button



What's a Bayesian Network?
9 Confirm Archive?✓

Figure 21. Improved Teacher archiving feature



ariechtw@stanford.edu

Ari Echt-Wilson

When does it become necessary to standardize outliers in K-means? 12h 19

what was the best project pitch? 3h 7

How can we sign up to take CS 147 next year? 3h 5

Thanks for stopping by! 1h 0

When does it become necessary to standardize outliers in K-means? 12h 19

what was the best project pitch? 3h 7

How can we sign up to take CS 147 next year? 3h 5

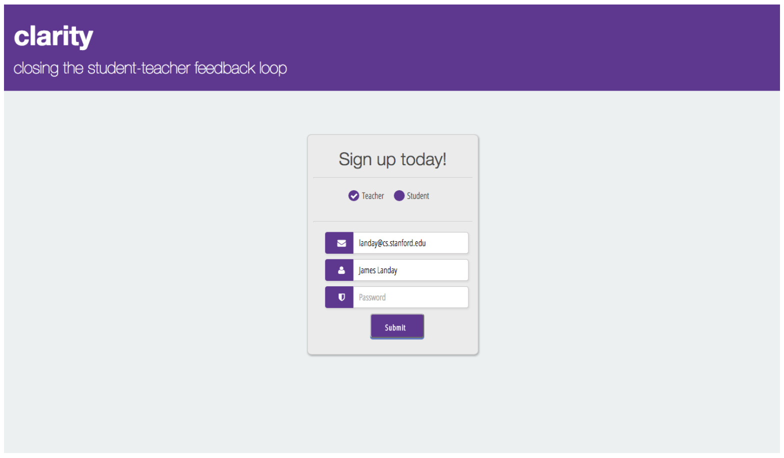
Thanks for stopping by! 1h 0

When does it become necessary to standardize outliers in K-means? 12h 19

How can we sign up to take CS 147 next year? 3h 5

What do I need to study for the final? 0m 0

Figure 22. Hi-fi Clarity Prototype Screens


clarity

closing the student-teacher feedback loop

Sign up today!

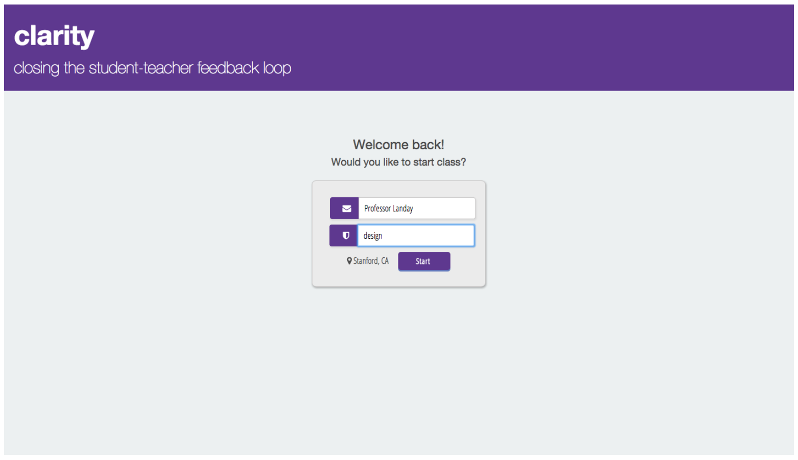
Teacher ● Student

landay@cs.stanford.edu

James Landay

Password

Submit


clarity

closing the student-teacher feedback loop

Welcome back!

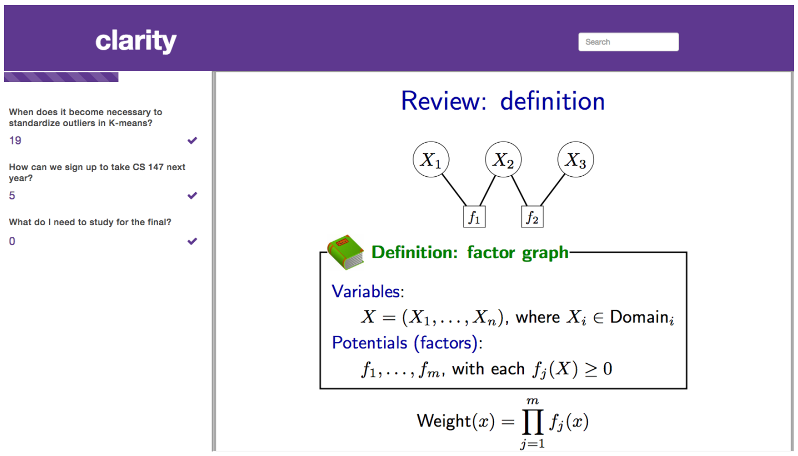
Would you like to start class?

Professor Landay

design

Stanford, CA

Start


clarity

Search

When does it become necessary to standardize outliers in K-means?

19 ✓

How can we sign up to take CS 147 next year?

5 ✓

What do I need to study for the final?

0 ✓

Review: definition

X_1 X_2 X_3 f_1 f_2

Definition: factor graph

Variables:

$X = (X_1, \dots, X_n)$, where $X_i \in \text{Domain}_i$

Potentials (factors):

$f_1, \dots, f_m$, with each $f_j(X) \geq 0$

$$\text{Weight}(x) = \prod_{j=1}^{m} f_j(x)$$

Figure 23. Hi-fi Teacher Prototype screens

V. Prototype Implementation

The prototype was implemented as a web application in node.js with MongoDB on the backend to store questions and socket.io to facilitate real-time communication between different clients.

Node.js was a web framework that both of the developers were comfortable with and the framework facilitated quick and unhindered development that allowed the team to ultimately focus on the design and the flow/feel of the application. Given that our data models were not very complex, MongoDB was a lightweight utility that we used to store our questions schemas. It's NoSQL structure also lended itself easily to integrating the metadata of timestamp and the number of upvotes along with the main content of each question. Socket.io allowed for real-time communication between clients on different devices or browsers, and was easily integrated with the web framework as a module of the framework itself.

As a web framework, node.js didn't provide the same native mobile experience as a full-fledged mobile application would have. It was clear to see that the buttons in the browser couldn't live up to the natural feel of a native application. There was also the challenge of making the application mobile-responsive. Though the front-end framework, bootstrap made this task easy enough, there were a few media queries that had to be inserted to make the application fit naturally within the screensize of a mobile device.

The student and teacher flows of logging in and signing into a class were all hard linked based on the option that the user chose in the beginning - student vs. teacher. There was no concept of a unique user models making it possible to actually switch between the teacher and student interface. Though all the questions are dynamic, the application included hardcoded data for the classes supported, the lecture slides, and the location in which the classes were situated. The understanding bar was also not synchronized with the toggle of each student button, so the bar's value was randomized between a range of 50-70% on each page reload.

Given more time, the most pressing features include the implementation of a toggled state between an understanding-state that allows students to remain engaged in the lecture with abbreviated teacher notes and an not-understanding-state where they can interact directly to add/upvote questions. Beyond that, future additions include a socket connection to update the understanding bar, the implementation of teacher-endorsed responses and student comments, and the retrieval and searching of stored/archived questions.