

clickED

Never Leave Class Confused

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Introduction

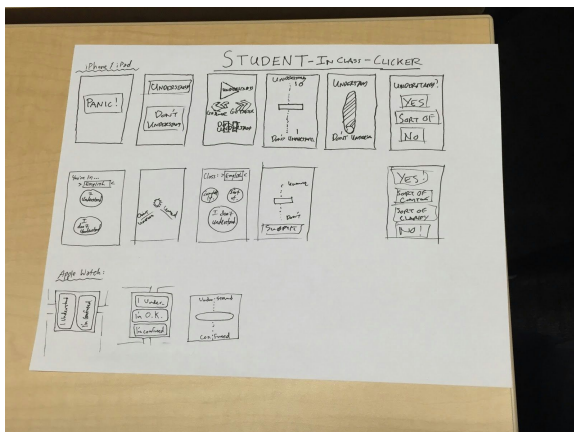
Mission Statement/Value Proposition: “Never Leave Class Confused.”

Problem: Students don’t want to publicly admit that they don’t understand class material, so teachers don’t have a reliable means by which to determine their students’ comprehension until it’s too late.

Solution: Anonymous student feedback removes the participation barrier, enabling teachers to both revisit what was misunderstood in real-time and to update their lesson plans based on this information.

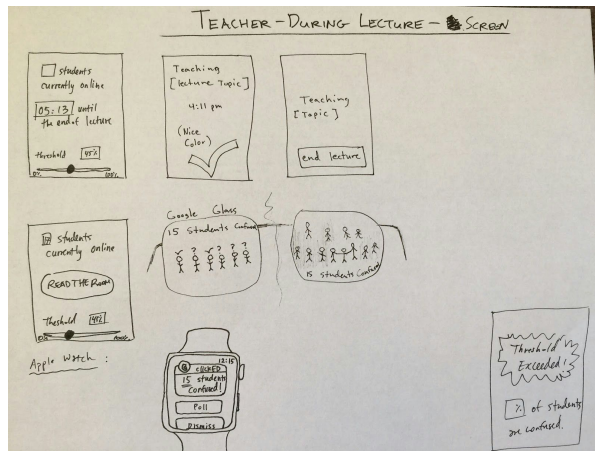
Sketches

Initial Sketches



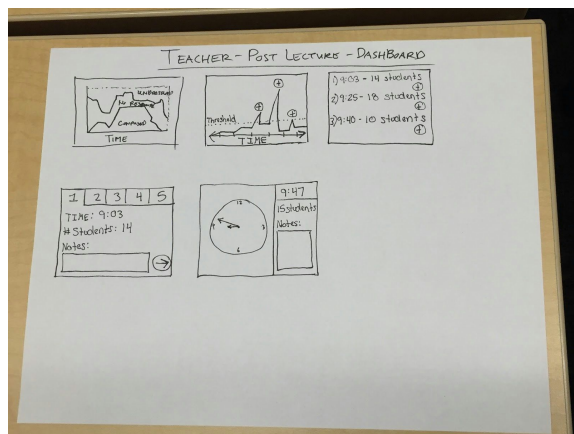
Student Class Interface

Our initial sketches for the student interface considered both iPad and Apple Watch interfaces. We sought to keep it simple to make it as unobtrusive as possible. The possibility of a granular, rather than binary, way to indicate level of understanding was seriously considered.



Teacher Class Interface

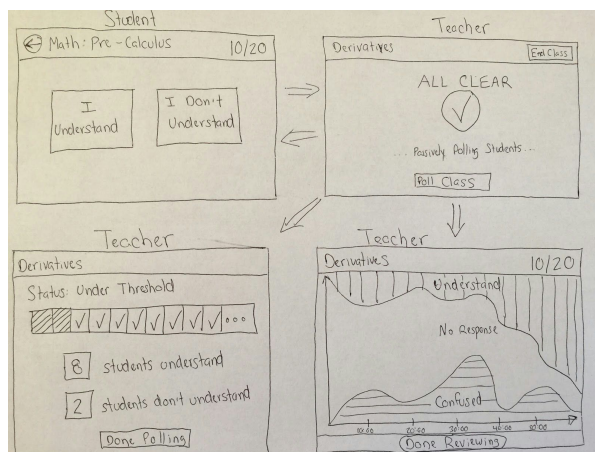
The teacher interface considered Google Glass, iPad, and Apple Watch versions. The watch sounded like the least disruptive version, and Google Glass had the ability to convey the most information.



Teacher Post-Lecture Interface

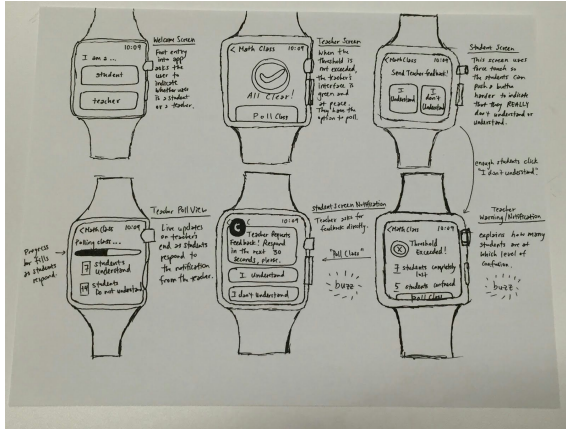
Finally, the post-lecture considerations were different types of graphs and the amount of information that should be collected for each class. By collecting information about the time of the class, we may be able to automatically populate students into their classes.

Storyboarded Sketches



iPad Interface Storyboard

The student's main screen will have two buttons to send feedback to the teacher (top left). The teacher's resting screen will be "All Clear" (top right). The teacher has to option to "Poll Class" at any point, but it is especially recommended after the threshold has been exceeded. The polling screen (bottom left) reports the student responses in real time. Finally the graph view (bottom right) conveys the class's understanding over time.

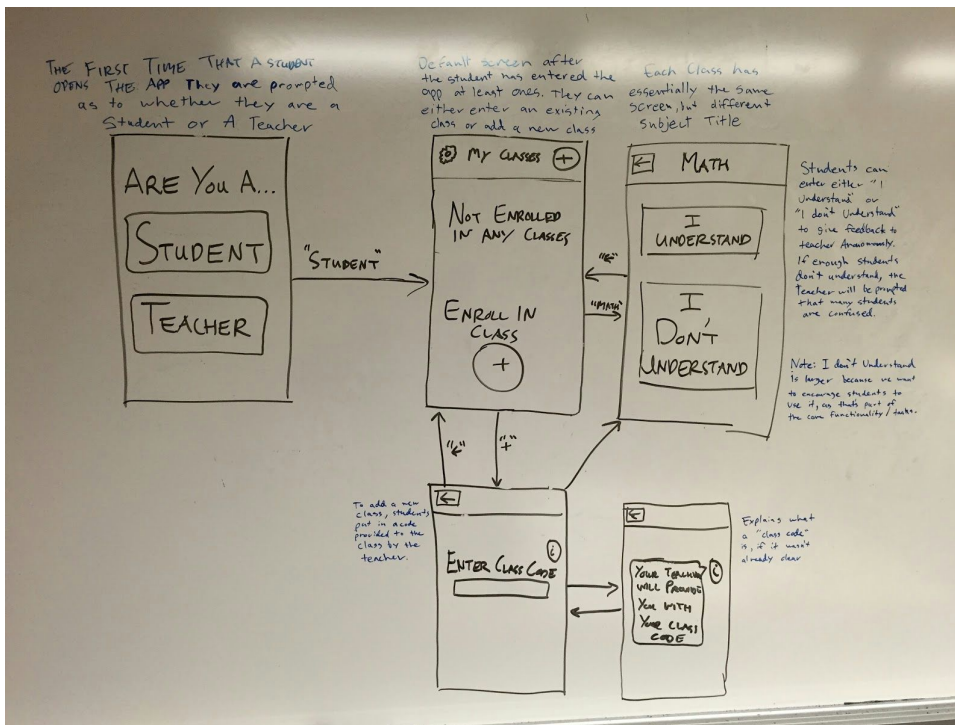


Apple Watch Interface Storyboard

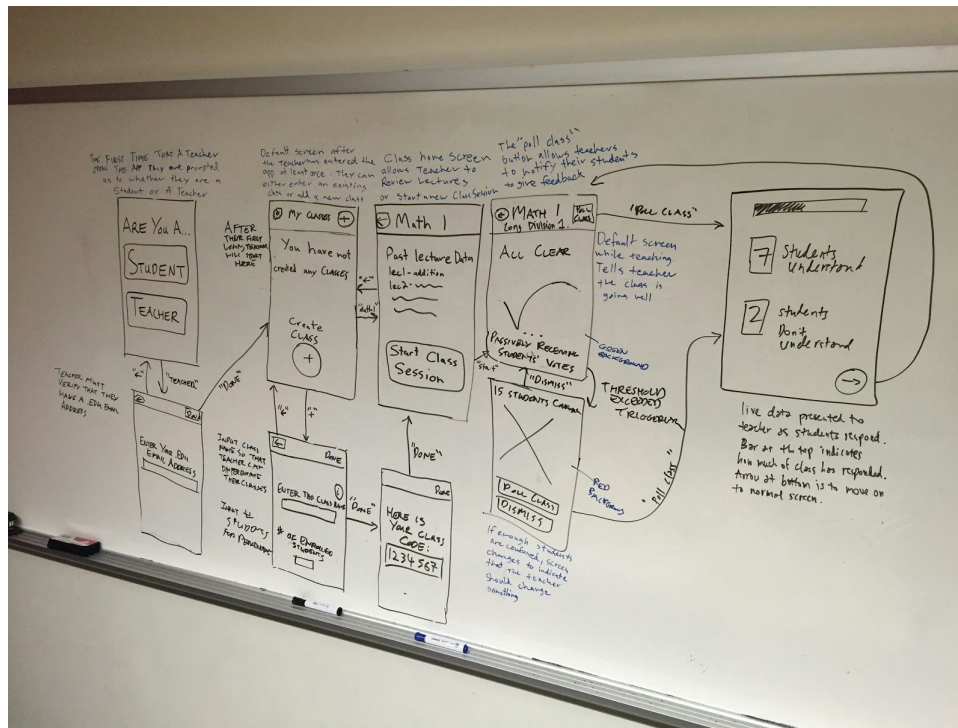
The teacher and student have identical main screens (top middle and right) to those in the iPad interface. The threshold exceeded notification let's the teacher know that the class is confused (bottom right). We also drew the notification students would get when the teacher starts polling the class actively (bottom middle). Finally the teacher still gets the real time information as the class responds to the poll (bottom left).

Selected Interface Design

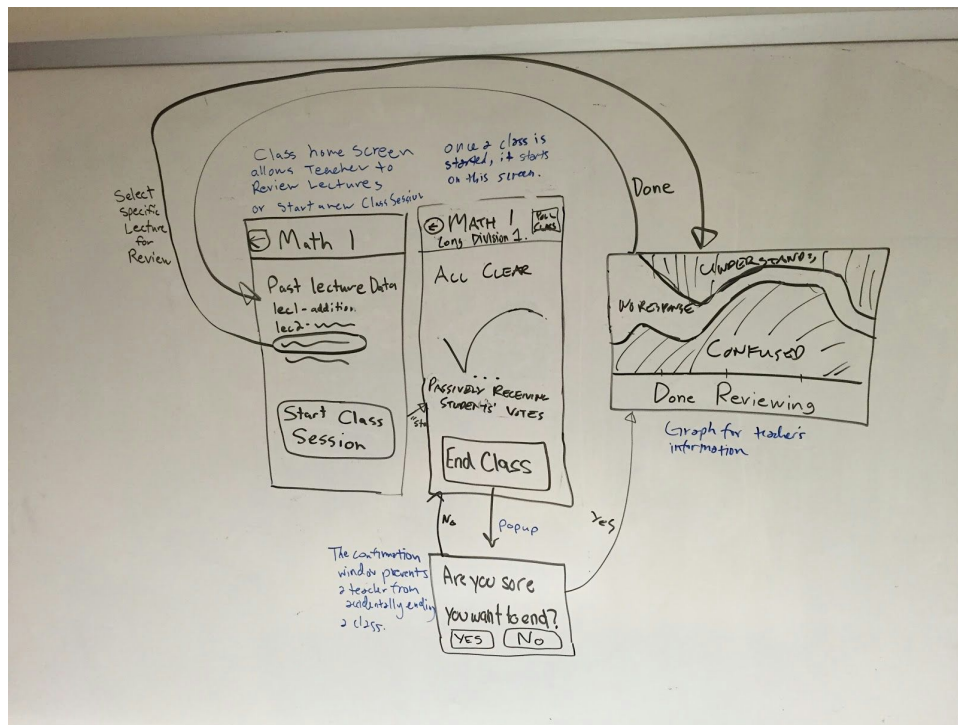
Three Task Storyboards



Task: Students let teacher know they aren't following.



Task: Teacher gets a sense of the room's engagement/understanding.



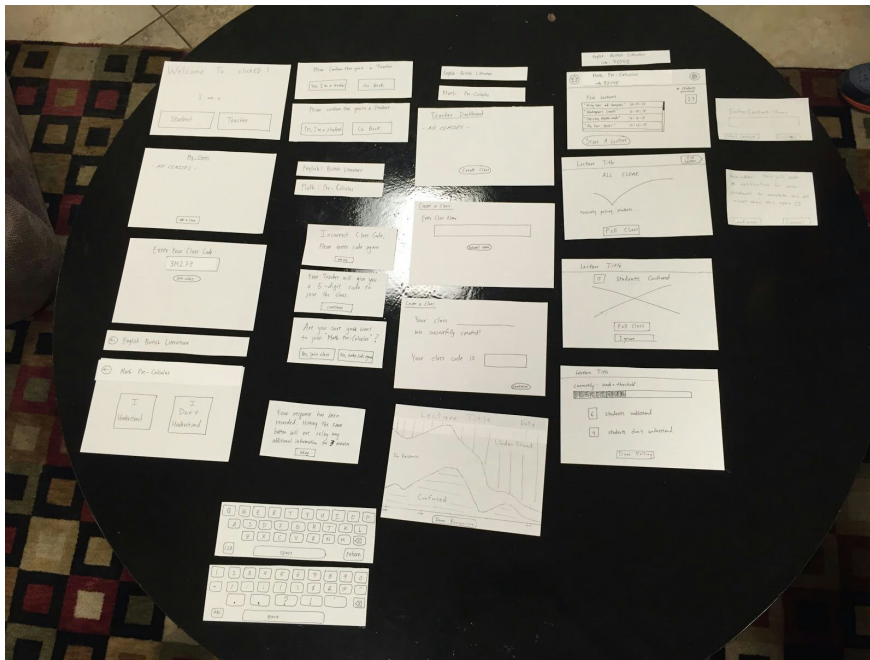
Task: Teacher reviews data from the lecture.

Decision Rationale

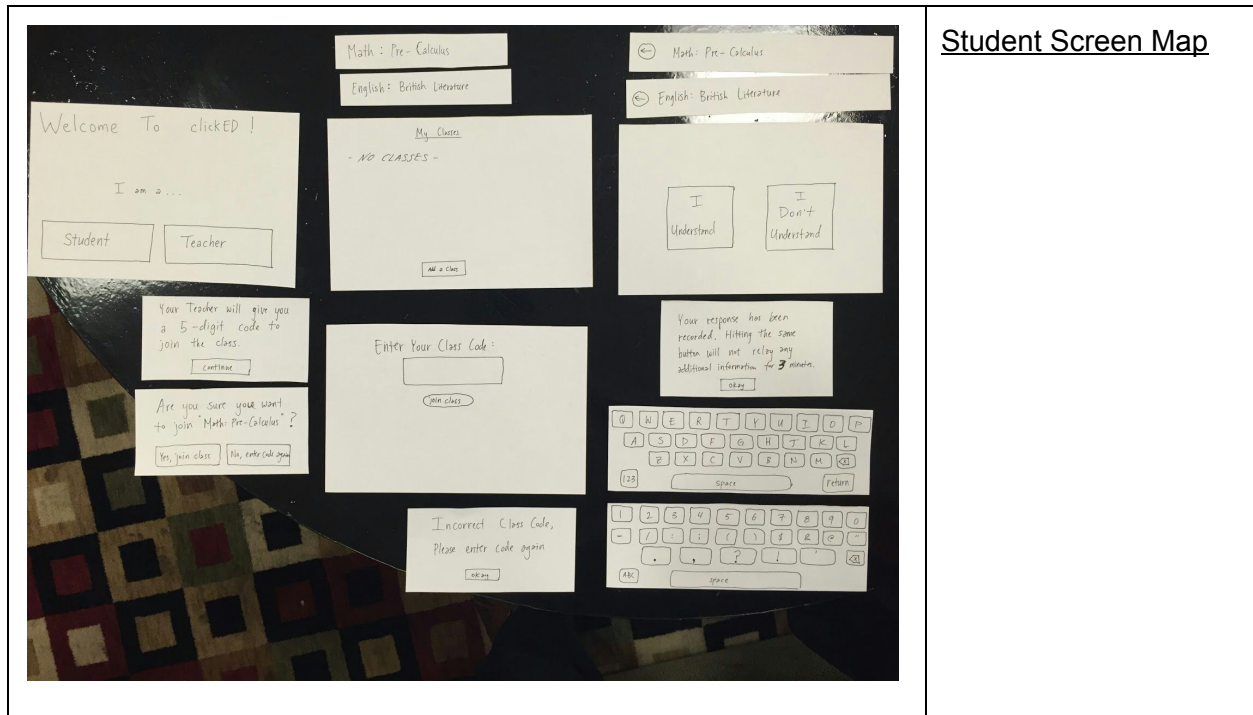
We had two reasons for choosing to go with the iPad interface instead of the Apple Watch interface. Our first reason was ease of use. Krister has an Apple Watch, and it was very difficult to complete our tasks with such a small device (even our simple tasks!). Second, the teachers need more data than can reasonably fit on an Apple Watch face. Although we liked the unobtrusive nature of an Apple Watch's notification over an iPad's ding, the Apple Watch could not show enough data to make the tradeoff worth it. The teacher needs more data than simply "Stop!". They also need to know the number of students that don't understand, the time that the confusion arose, and the ability to re-poll the class. We couldn't do any of these things very easily on an Apple Watch.

Prototype description

Entire Screen Map



Teacher Screen Map



Student interface

Diagrams 1-7 are steps required for adding a class and getting the app set up. The primary student task is encapsulated in Diagram 8, where students can offer feedback. The dashboard in Diagram 2 will eventually hold all the student classes. Diagram 10 shows a notification that the student receives on a locked iPad when the teacher polls the class.

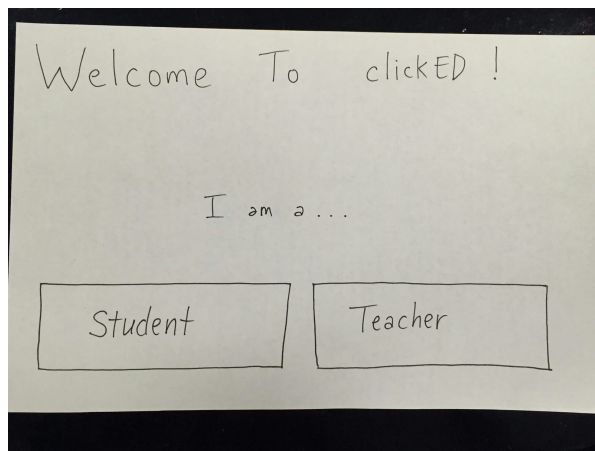


Diagram 1

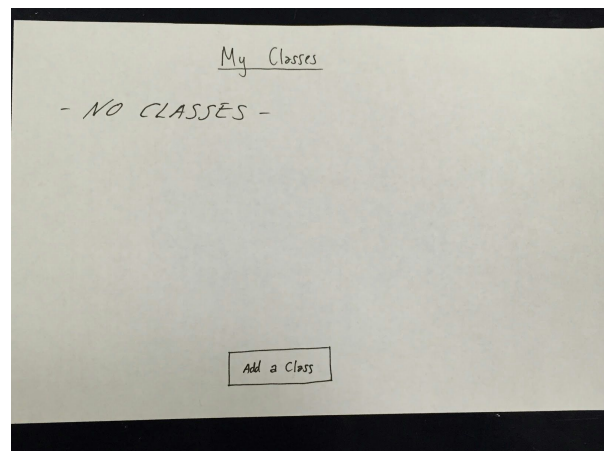


Diagram 2

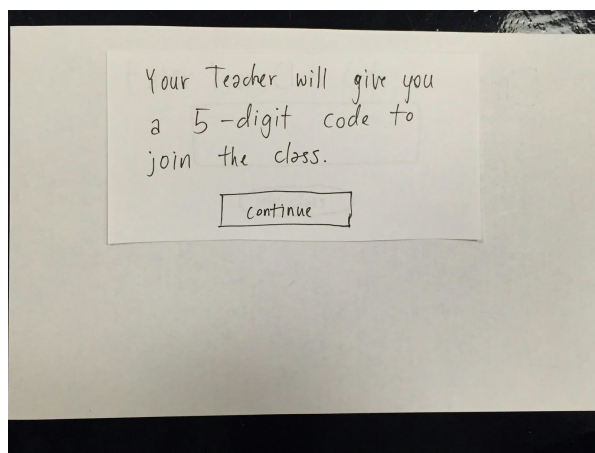


Diagram 3

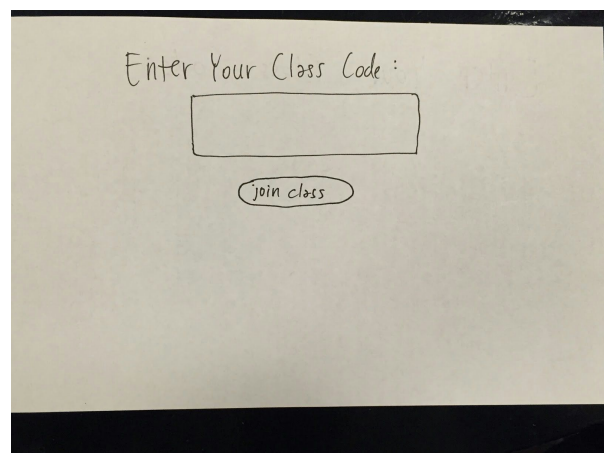


Diagram 4

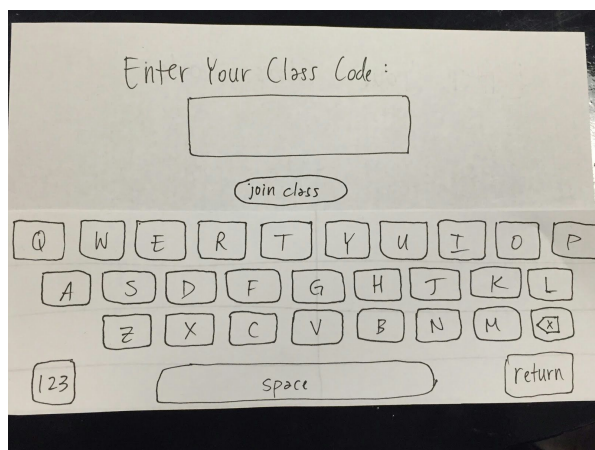


Diagram 5

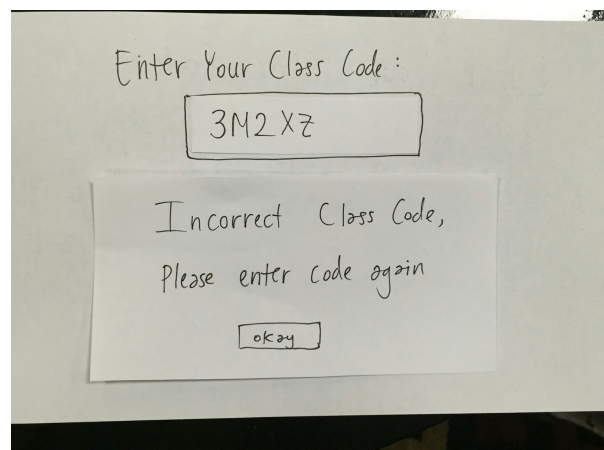


Diagram 6

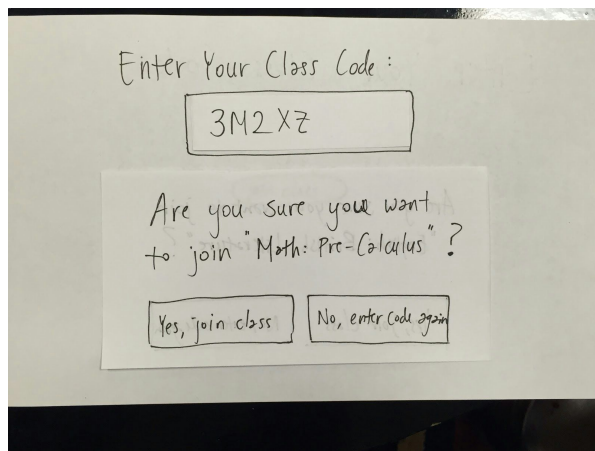


Diagram 7

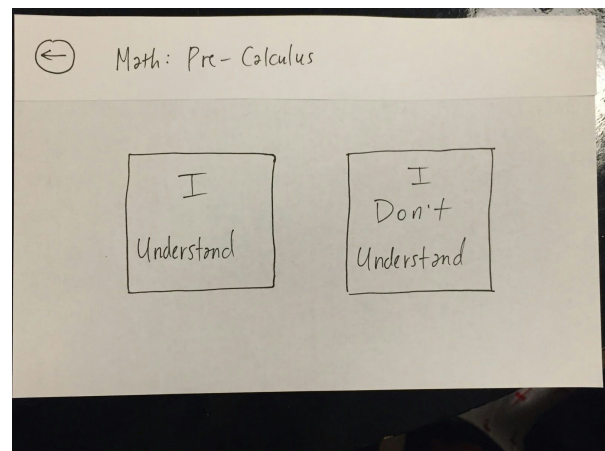


Diagram 8

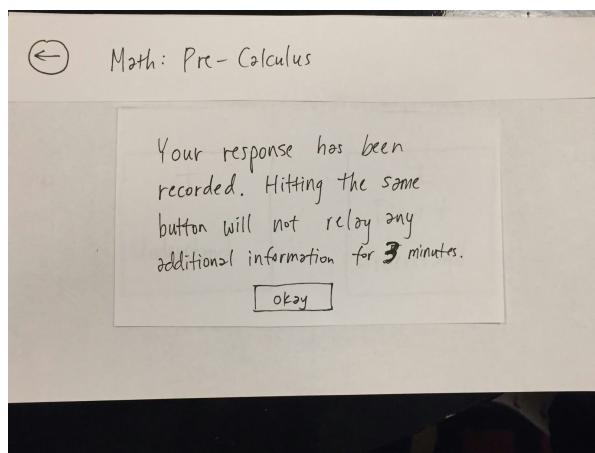


Diagram 9

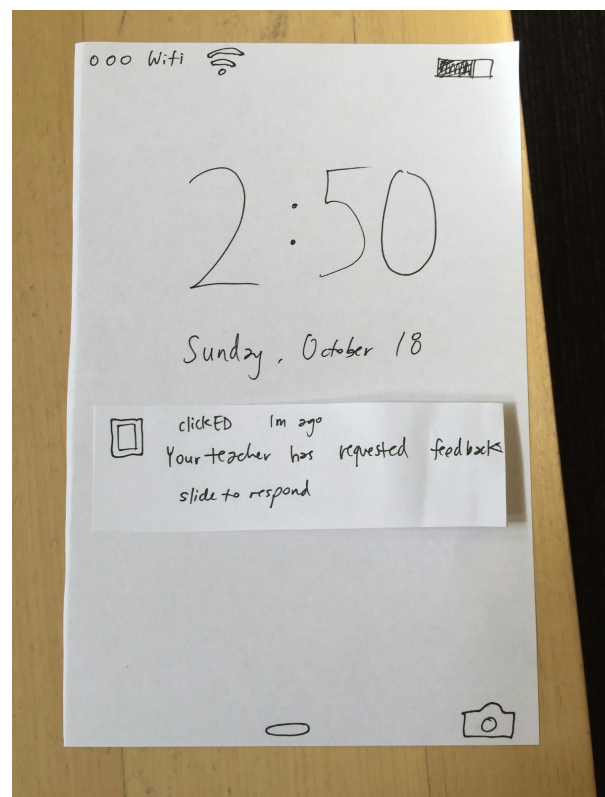


Diagram 10

Teacher interface

Again, Diagrams 1-6 are for setting up a class, and should only be used at the beginning of the year. The task of reading the room is accomplished by Diagrams 11 and 12. Diagram 11 notifies the teacher that a significant portion of the class is confused. And teachers can get to Diagram 12 from both Diagrams 10 and Diagram 11 - no matter how the class is doing, teachers can poll the room and get an accurate read. For the second task of reviewing the data, the

teacher's class dashboard in Diagram 7 keeps track of all lecture data, which can be clicked to get to Diagram 13. Diagram 14 shows a notification on a locked iPad.

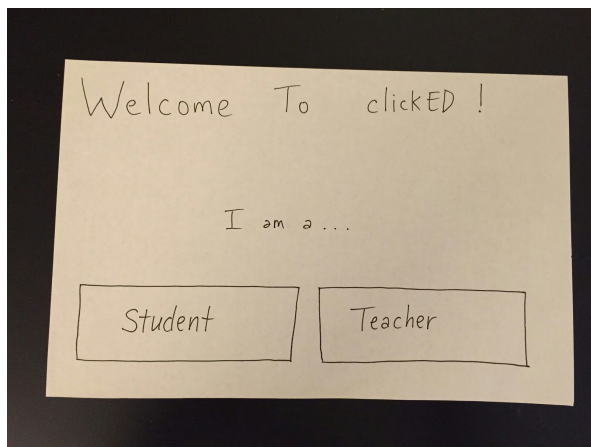


Diagram 1

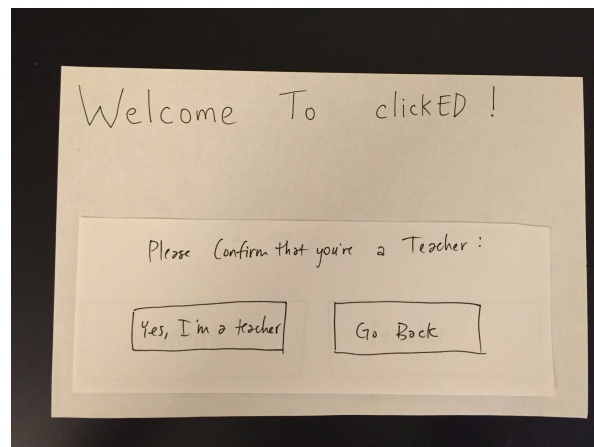


Diagram 2

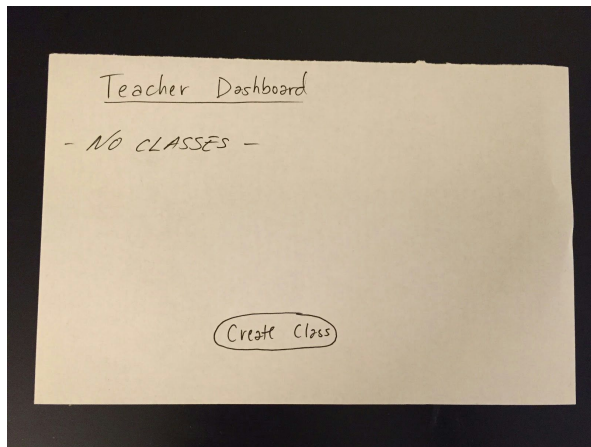


Diagram 3

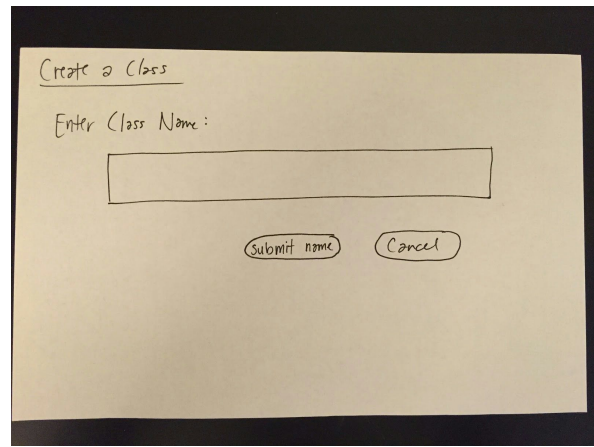


Diagram 4

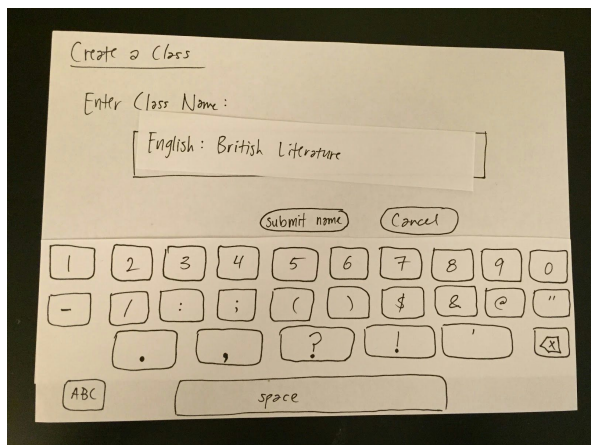


Diagram 5

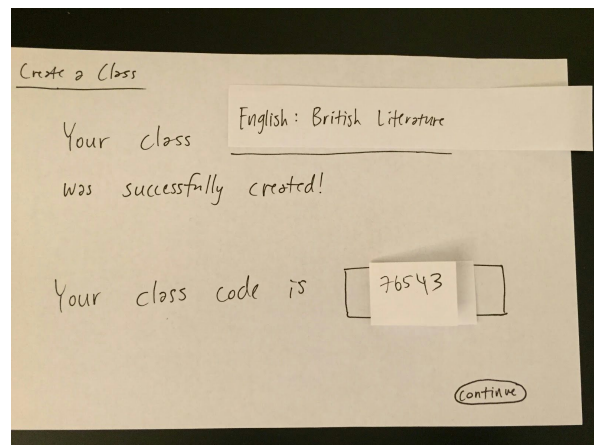


Diagram 6

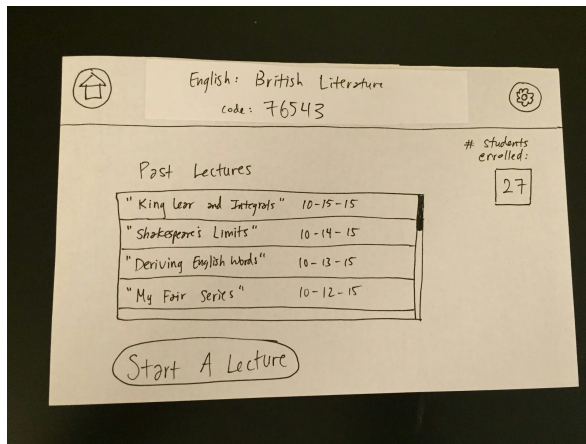


Diagram 7

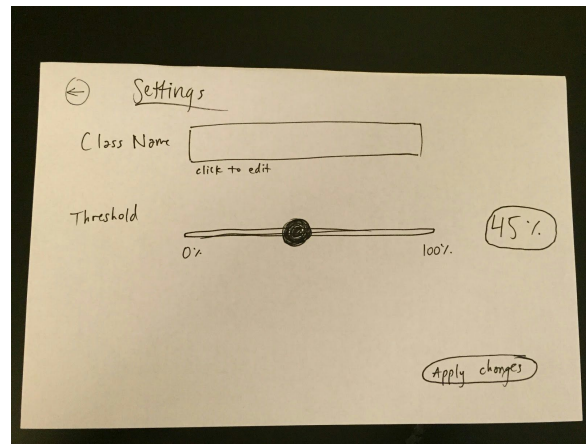


Diagram 8

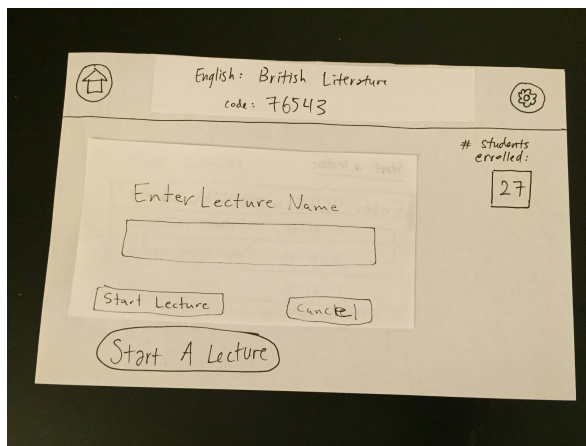


Diagram 9

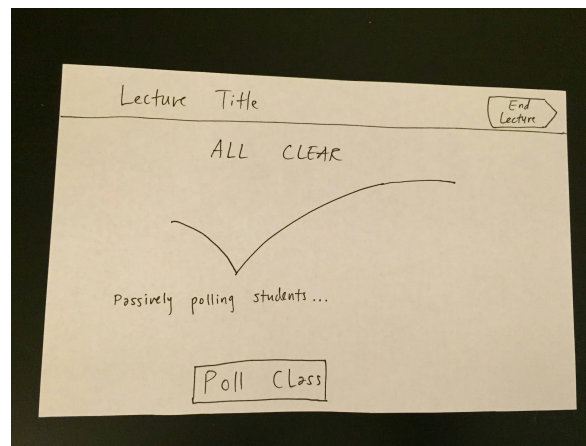


Diagram 10

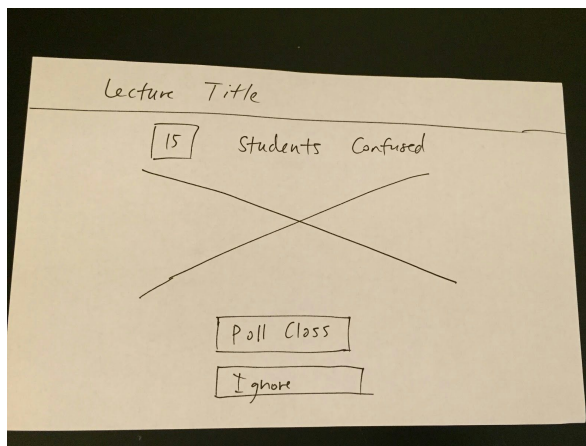


Diagram 11

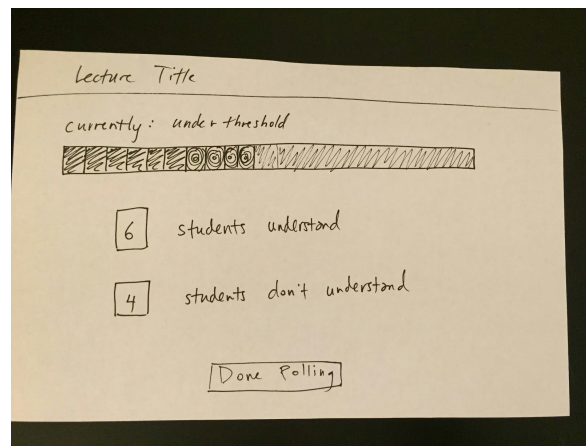


Diagram 12

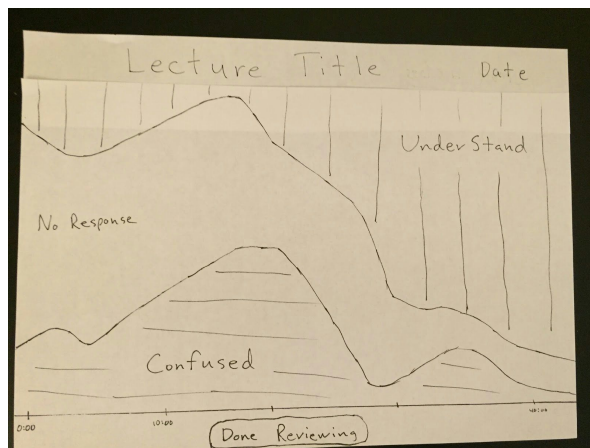


Diagram 13

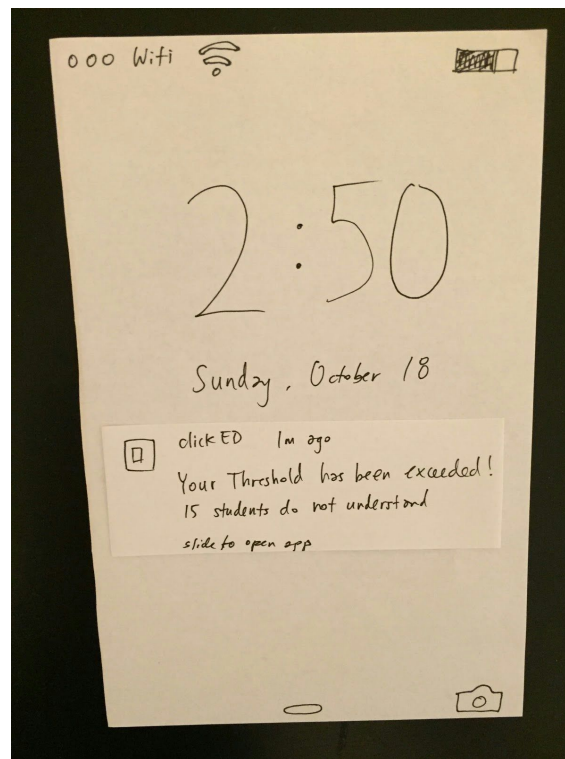


Diagram 14

Methods

Participants:

Subject 1: Religious studies teacher in their sixth year of teaching who occasionally allows students to use iPads for research

Subject 2: World history teacher for sophomores who created his own e-book for iPad that his class uses, including built-in questionnaires

Subject 3: Veteran Spanish teacher who occasionally allows students to use iPads for group projects

Subject 4: High school senior who didn't feel comfortable voicing confusion in class

Subject 5: High school senior who felt very comfortable raising his hand in class

Recruitment:

We recruited all our testers from Bellarmine College Prep (where Michael went to high school) because they already have the necessary technology infrastructure and culture of our initial target user. In order to recruit our teacher participants, we first spoke to one of the school's administrators, and she introduced us to teachers that she thought would be a good fit. We conducted all our interviews with teachers who were free during one of their break periods. We received verbal consent from each participant. In order to recruit our student participants, we

went to the library and asked the librarian for permission to conduct the interviews in an empty conference room there. We then found students who were not actively working and asked them to spare 15 minutes.

Environment:

Subject 2 was interviewed in the teacher's lounge, a space where teachers work on their lesson plans and relax during their prep periods. Subjects 1 and 3 were interviewed in their respective offices. Subjects 4 and 5 were interviewed in a library study room.

Tasks:

Teachers were assigned two separate tasks. First, they were asked to set up a class for students to join, which helped us see how first time users would respond to the app. Second, they were asked to review the class data at the end of a lecture. Students were asked to use the app in class, both to signal understanding and lack of understanding.

Procedure:

We presented the teachers with two tasks before they started interacting with the prototype. Between the two tasks, they had to deal with the "threshold exceeded" notification. We simply presented it to them shortly after they arrived at the "All clear" screen. Students were asked to register as students and immediately begin using the app.

Test Measures:

We tried to measure the clarity of instructions and the flow through the app by focusing on two key measurements: 1) Number and severity of errors and 2) the ratio of the time spent on instructions compared to how much they got out of them.

1. **Errors:** In addition to keeping track of the number of errors, we more importantly focused on any confusion that forced the users to stop progressing. These critical errors would inform our future design improvements.
2. **Instruction Time/Clarity Ratio:** We included several pop-ups that included fairly detailed instructions at critical points throughout the app, and we judged how long/cumbersome the instructions were in comparison to the how helpful we perceived them to be for users. This ratio will be very important to get right to ensure we convert the maximum number of new users to consistent users.

Results

Subject 1:

For task #2, our first teacher subject did not understand that the purpose of the class code was for his students to use as a one-time entrance code. When he arrived at the class session landing screen, he was confused by the "all clear" and "passively polling" messages as he had forgotten about that functionality. His natural instinct was to press the first button he saw, which

was the “poll class” button. We simulated both the passively and actively triggered polling events, and he was confused as to why the results were the same. He expected there to be more specific/customizable information when he actively polled versus when he passively received the notification that his class was confused. He was also nervous that his students would abuse the “I’m confused” button in order to slow down his class, so he thought it would be better for students not to be anonymous to him. For task #3, he easily ended the class and accessed the data. He understood the graph, but he admitted that with just the lecture time as the x axis that he wouldn’t remember what he was teaching during the moments of peak confusion. He added that if we could record the audio that he would be able to listen to the times indicated in the graph to help him adjust his lessons.

Subject 2:

For task #2, our second teacher subject, who was our most tech savvy teacher, breezed through the class and lecture creation steps with no confusion. He commented that the word “lecture” wasn’t as applicable to high school and that he should have the ability to name or select a variety of different class types. This subject also got confused by the class session landing screen as he didn’t understand why it was already actively polling and didn’t know if there were any additional steps required for him to start teaching. When we simulated both polling events, he indicated that he wanted to be able to select the number of confused students in order to see who they were and help them. He also indicated that he wanted more flexibility in the types of polls and that he wanted to know specifically what his students were confused about. He wanted to be able to set-up polls in advance that were specific to what he planned to teach that day. For task #3, he accessed the graph easily, but he admitted that the presentation in its current state was not helpful. He wanted to see which students were confused, at what times and what they were confused about. He also wanted individual student views, as well as progression data over week and month long periods.

Subject 3:

For task #2, our third teacher subject progressed through the interface well, but he had similar confusion around the class code and “all clear” screen. He understood what the class code would be used for, but he wasn’t sure if needed to save it now because he couldn’t access it later. He also said that he wanted to see specifically what students were confused about instead of the “I’m confused” indicator. For task #3, this subject easily accessed the data, but he was very confused by the graph and completely misinterpreted its data. He also said that the timeline wasn’t a useful axis as he wouldn’t remember what specifically was taught at each time. He suggested that if we stick with a graphical view that we potentially link confusion to particular slides of a presentation instead of time. He preferred a view in which he could analyze each student in a grid versus a graphical layout.

Subject 4:

For task #1, our first student subject easily navigated the standard interface, as well as the notification-based interface students can access from the lockscreen. He wished that he would have been able to specifically state what he was confused about when he tapped the button. He

suggested that we let students see their classmates' anonymous questions, so they can "upvote" them and not type out the same question.

Subject 5:

For task #1, our second student subject progressed through the interface easily, but he was annoyed that he had to enter a class code instead of automatically being enrolled based on his schedule. He said that apps can easily be integrated with their school's Student Information System, Power Schools, via their API to access class roster and schedule information for clickED. He also stressed how important it was to maintain anonymity during class so that students don't get "called out" during class.

Discussion

The overall takeaway from the experiments was that the users immediately saw and agreed with the need, but they wanted more specific information in order for our solution to be sufficient. Students really appreciated the simple, clear interface and indicated that they wouldn't find it distracting in class. Teachers felt like they were missing this kind of feedback, but they noted that the current workflow was not as seamless with their current practices as they would like. The experiments revealed two key sticking points with the UI, as well as three needed functionality improvements. The consistency of the feedback across both user groups without any prompting clearly indicated that these were all must fix issues.

UI:

The class code caused two of the teachers serious problems, which resulted in them not knowing how to continue. We presented the code during the "successfully created your class" screen without any context. There was no clarification on its purpose or that it was going to stick around if the teacher left the screen. We had a pop-up that explained the class code to the students, and they found that to be sufficient explanation. To fix this issue on the teacher's end, we should introduce the code when they first select the class after creation, so that they know what to do before they start their first class session. It should be on its own screen with an explanation on what it is and how they should share it with their students.

Secondly, teachers unanimously were confused by the landing screen that stated "All Clear" and "Passively Polling Students." Starting with the "All Clear" status without having done anything threw them off, and every teacher felt the instinct to immediately push the "poll class" button as soon as class began. To fix this, we should add a pop-up after a teacher starts a class session the first time that reminds them about the passive polling functionality. We should also remove the positive status so that their default screen is neutral and clean, and it only changes when it passes the threshold. It is still unclear if this confusion arose from the interface itself, a lack of understanding of how the app works, the static nature of the low-fi prototype screen or a combination of the above.

Functionality:

Based on our initial needfinding, we thought that full anonymity would yield the highest participation. We discovered that teachers only found the information to be valuable if it was attached to an actual student. Teachers mainly wanted this information so that they could reach out to struggling students after class, and we found that students were actually ok with their teachers knowing after class. To fix this, we will keep students anonymous to other students and teachers during class to remove any barriers from participating in the app, but teachers will be able to access student specific data after class. This does mean that we will need to update the student log-in flow to reflect the fact that they now have more robust profiles.

We also thought that in order to minimize distraction during class that a minimal, binary input interface would yield the best results. We discovered that both students and teachers desired more specificity than “I’m confused” or “I understand.” However, there was a tendency for both sets of users to want to push the burden to add that specificity onto the other user. To fix this, we should enable both sets of users the ability to add specific questions. When students press I don’t understand, they will get prompted with some sort of text input to add their question. We are also thinking about students voting on their classmates’ questions or selecting pre-defined topics as well. When teachers start a class session, they will be able to set-up specific polls in advance that they can push out to their class.

Finally, based on the previous two pieces of feedback, as well as the confusion and dissatisfaction with the current graphical interface, we will need to update what information we display on the post-class dashboard. We want to include a student specific view to track an individual student’s questions, as well as an overview of the class that also includes the confusing topics in addition to a timestamp. We are also considering adding audio recordings as an extension at some point, especially for newer teachers that want to use our app to improve their teaching practices. We still don’t know if the confusion with the graphical was just due to its static and minimalistic representation in the paper prototype.

WORD COUNT: 2810

Over because we interviewed 5 people.

Appendix

Notes:

Subject 1: 6th year religious studies teacher - the interview took place in his office.

Task #2

- Class code is unclear what it is used for
- “ALL CLEAR” screen confusing...people really don’t know that is going on
- Passive polling similar to responding to issues during presidential debate
- When actively polling, let teacher set “do you understand this” either during class or ahead of time
- Expected there to be a difference in the capabilities between active and passive polling

Task #3

- Record lecture audio - otherwise the teacher can’t get very useful information from graph, as teachers said they never know what times they are covering what topics
- Kids are trolls - how to avoid kids just messing with the buttons to slow down the class
 - One way to do this is to remove anonymity, so that teachers can deal with it
- Teachers primarily use feedback immediately after lecture
- If audio recordings are too hard to keep, let teachers download them before auto-delete
- Tech requires extra monitoring from teachers - don’t add to it (ideally do opposite: help monitor)
- Learning to speak up is important - and letting students always shyly indicate that they are confused is potentially a bad thing for some academically gifted students (i.e. there are students who would have learned to speak up, but won’t learn with this app)

Subject 2: Sophomore World History teacher - the interview took place in the teacher’s lounge during one of his breaks

Task #2

- Teachers need to see specifically what students are confused about - need some mechanism to judge.
- Making own textbook dramatically reduces need to lecture, as the books exactly fit what I want students to learn
- Don’t call it a “Lecture”, call it something more open ended and nice, like a session or activity
- Flexibility in polling - should be able to be specific or very general
- Tech potentially allows for teachers to treat every student in the way they would teach the student 1-on-1, which is the ideal. Getting closer to this ideal is good (letting

teachers more efficiently figure out the information they would figure out in an individual setting)

- Set up specific polls ahead of time. Or potentially allow teachers to push “one question quizzes” to see if everyone is following (problem of people asking neighbors potentially, could be solved by fast time limit)

Task #3

- Put students’ individual info into graph somehow, either with expandables or some way to see in a larger graph how students transitioned between groups.
- In addition to single class data, it would be great to see progression or growth data for individual students and his class

Subject 3: Veteran Spanish teacher - interview took place in his office

Task #2

- Class code unclear - even though he knew what it was, he didn’t know if he needed to save it independently or if the app will remember (maybe get rid of “this is your class code” screen, and replace with popup)
- Integration with other classroom tools would be excellent (since this is hard, the easier thing might be to let them easily run alongside existing apps)
- “ALL CLEAR” very confusing
- Let students enter what they are confused about - more specific
- Switching between tasks seems cumbersome, ideally more seamless (more obvious what he needs to do to accomplish certain tasks - this might be accomplished with a tutorial)

Task #3

- Click on “Students don’t understand” for list of the students would be useful
- Would be a very useful tool for new teachers, who haven’t already gotten set on a certain style and need to learn what works with students and what doesn’t work.
- Liked small, touchable things that get more specific feedback from students on graph

Subject 4: High school senior who didn’t feel comfortable raising his hand - interview took place in a conference room attached to the library

Task #1

- He wanted to be able to expand on what he specifically didn’t understand rather than just the binary response
- He wanted to be able to see classmates’ anonymous questions and “upvote” them, so that each student didn’t need to write the same question and teachers could see the most pressing ones

- He really liked the responding to polls from the lockscreen on his device
- No anonymity with teachers wouldn't affect his participation

Subject 5: High school senior who felt comfortable raising his hand - interview took place in a conference room attached to the library

Task #1

- Rather than give students access to a full keyboard when typing in the class codes, give them only the keys that make up the codes in order to avoid mistakes
- Confused about one-time use of class code. Thought it would be better to enable students to add their schedules, so that each class session in the app would start automatically at the right time (We could also accomplish this through integrating with their SIS/LMS Power Schools)
- During Lecture, anonymity is good so that teachers don't unintentionally single out the confused kid (e.g. start asking them questions to try and help judge if they get it, when the kid really doesn't want to be called on!)

Script:

Opening Questions:

Students -

- How do you currently use iPads in class?
- Do you find them distracting while the teacher is teaching?
- What other apps do you currently use while in class?
- Do you feel comfortable raising your hand when you have a question?

Teachers -

- How do you currently use iPads in class?
- How do you determine when your class is confused?
- Are your students distracted by technology while in class?

Explanation of clickED:

A quick overview of the app - Students will be able to anonymously select "I don't understand" or "I understand" on their app throughout class. On the teacher's end, when enough students have selected I don't understand, it will alert them on their device. Teachers can then choose to stop progressing that class and review the most recently covered material again. Teachers can also actively poll the class with one button if they want to get a consensus on student understanding of a particular topic. After class, teachers will be able to see a graph of this data that they can use to update their upcoming lesson based on what students still don't understand.

Intro:

So here is how this is going to work - We are going to put a series of pieces of paper in front of you that will try and simulate what the app will look like and how it will function. As you press "buttons" like this one (show student facing button for teachers and teacher facing button for students), we will present you with another screen based on what you selected. We will give you a particular goal that we want you to achieve, and we want you to go through the app in order to achieve that. It would be great if you could talk through your decision making process and observations as you progress through the app that would be great!

Task1: Your goal is to join your pre-calculus class on clickED and submit feedback to your teacher.

Task 2: Your goal is to create your British Literature class and poll your students during class.

Task 3: Your goal is to end your class and review your class data.