LearnAble

Getting the Design Right

Contribution Statement

Sarah Marshall: 25% - Wrote Digital Mockup section
Michele Miao: 15% - Wrote Overview and created template/outline for the report
Sanjit Rajendiran: 35% - Initial Paper Prototype, Testing Process, and Appendix. Wrote parts of Discussion.
Max Tian: 25% - Wrote Discussion

Team

Sarah Marshall: User research, ideation
Michele Miao: Design, project management
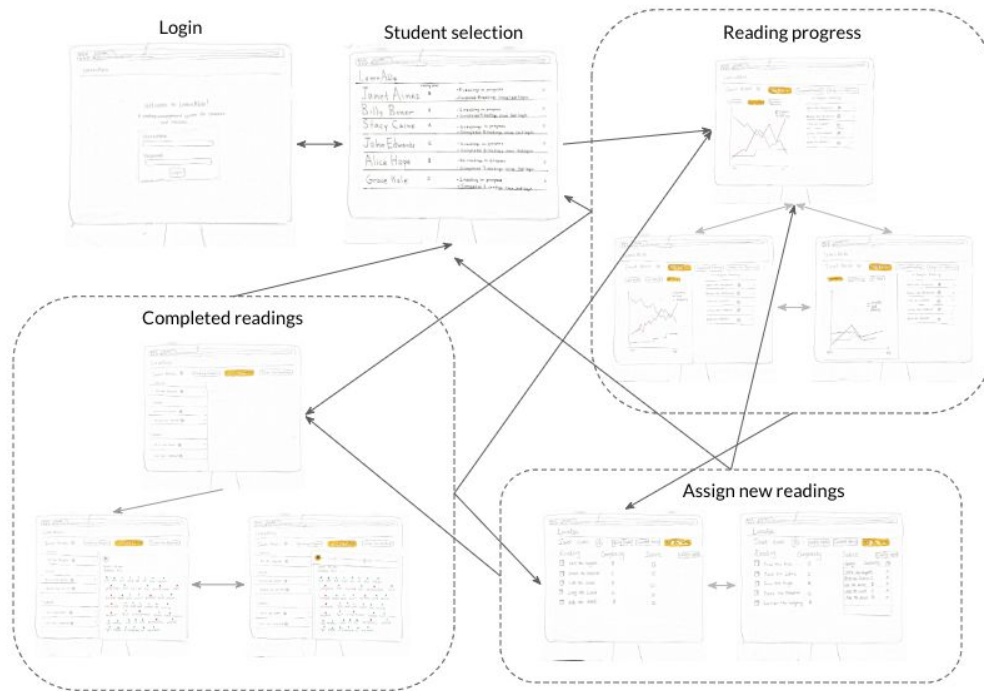Sanjit Rajendiran: Ideation, usability testing
Max Tian: User research, task development
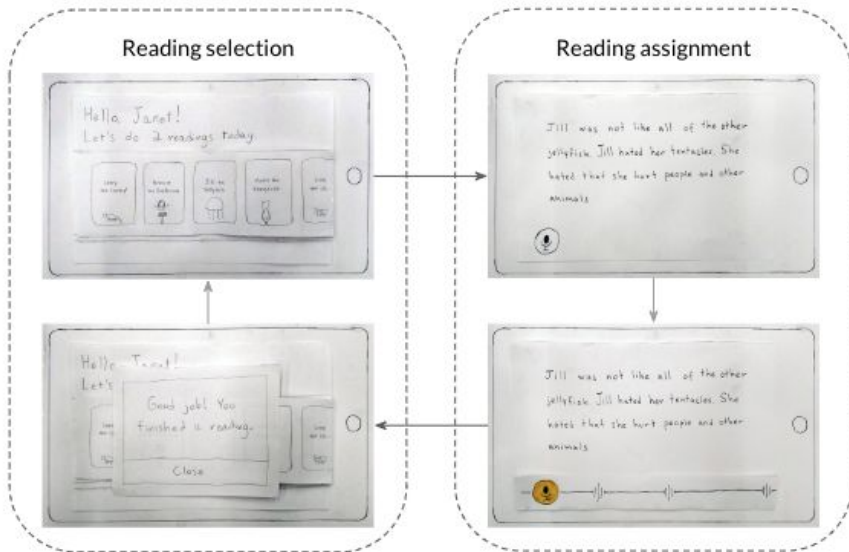
Problem and Solution Overview

Dyslexia is a learning disability characterized by difficulties with languages skills, especially reading. About 5-17% of children in the United States have developmental dyslexia, making it the most common language-based learning disability. Children with dyslexia usually have difficulties learning in the classroom, so many students with dyslexia attend special education or receive one-on-one tutoring in order to receive instruction that is specifically targeted towards them. With effective intervention during the early stages of literacy, the gap between dyslexic and non-dyslexic students can be minimized. However, this intervention is usually not effective, because teachers for students with dyslexia have trouble personalizing instruction for each individual student. These students often end up feeling frustrated, unconfident, and socially disadvantaged because of their disability. There is a need for new and creative approaches to teaching dyslexic students.

Our proposed solution is a reading management system to support personalized reading instruction for students with dyslexia. The system has a library of reading passages, categorized by their level of difficulty with regards to vocabulary and grammar. Teachers can easily assign passages at the appropriate difficulty level for their students on their interface. To determine an individual student's reading level, a student can record themselves reading their assigned passage out loud, and the application notes the words that the student struggled with and finds patterns between those words. The teacher can use this data to gain a deeper insight into their student's reading level, and structure their instruction accordingly.

Initial Paper Prototype

Login

Student selection

Reading progress

Completed readings

Assign new readings

Task 1: Select engaging reading assignments at an appropriate level

Reading selection

Reading assignment

Task 2: Record and transcribe audio of reading out loud

Testing Process

Katherine is a Ph.D student at the UW Paul Allen School of Computer Science and Engineering. Her research involves developing online technologies to study dyslexia. Since she is familiar with designing interfaces for users with dyslexia, we asked her to participate in our usability test. We conducted the usability test in a CSE "breakout" area out of convenience for Katherine. Michele administered the test and took notes, while Sanjit assumed the role of the computer.

John Doe is a college student who we had previously performed a directed storytelling approach on. Because he had had an emotional experience with dyslexia in his childhood, our intention was primarily to gain qualitative insight on our interface. In the end, however, we received good technical AND nontechnical feedback. Sanjit conducted this test alone, with no outside noises or distractions; it lasted about 20 minutes.

Richard Ross is a current student at Carnegie Mellon studying Computer Science. We thought he would be a good fit for our research because he has taken coursework related to design and was a childhood friend of John Doe, our subject for Usability Test 2. Sanjit conducted this test one-on-one, through Google Hangouts; it lasted about 15 minutes.
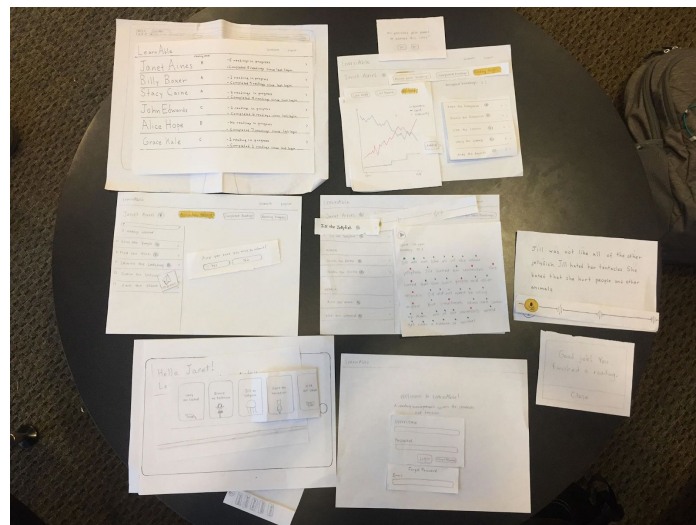
Our testing methods evolved over the course of the design process. In the beginning, we primarily made use of the looser heuristic approach, which gave us broad, unbiased insight into issues within our interface. For instance, the in-class evaluations with Fantahun and Candice revealed a fundamental lack of system status visibility, meaning that in our initial paper prototype it was unclear which readings were truly being read by students and which had been assigned but not attempted. After further developing our paper prototype, we shifted towards a more structured format in projects 3c and 3d that identified problems in the context of the two tasks, which we changed to "Monitor student reading progress remotely" and "Select engaging reading assignments at an appropriate level."

Testing Results

The first key revision we have is the confirmation page. Since there are buttons that function as cancel, submit, or logout, it is important to have confirmation page to prevent users from clicking on the wrong button accidentally. Our design sends data between students and teachers. By having confirmation pages could help both students and teacher. For example, students do not expect to see readings assign to them changed just because teachers selected the wrong book and accidentally assigned to students. Also, teachers do not expect to see unfinished reading audios or wrong audios submitted just because students accidentally click the submit button. For our design we want to make sure we do not confuse users by accident operations.

The second key revision we have is the naming and layout for labels. Our design interface has many buttons with either names or icons. Before usability test, we thought they are making enough sense for users. However, as we walk through the usability test we have found that some names are confusing for users. For example, the reading level labels would confuse users just because the meaning is not clear. Also, the "X" button which means cancel the reading is too close to the ">" button. This confused most of the users because they do not know what to do. Naming label is very important because users should be able to tell what the function is by clicking it. However, there are universal symbols that users could understand which do not need to write in words. However, we also need to consider the layout for labels because sometimes labels are too close to each other might change users understanding of the name.

The last key revision we have is adding more helper functions. For example, if the users forgot user ID or password. Sometimes users cannot go back to previous interface (even it is not necessary). These are not big issues, but it will help to improve performance for our design as a whole.

Final Paper Prototype
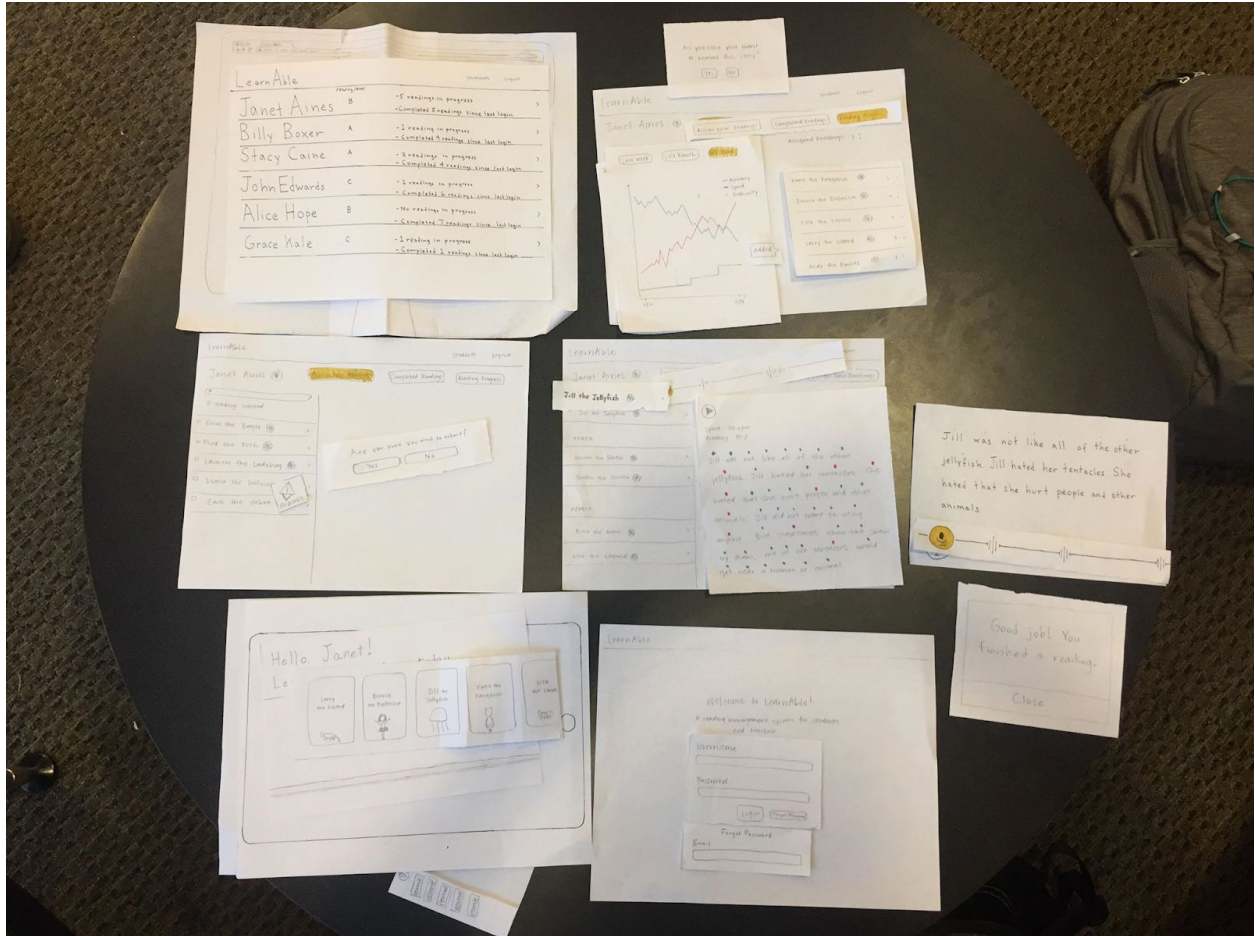
Task 1: Monitor student reading progress remotely

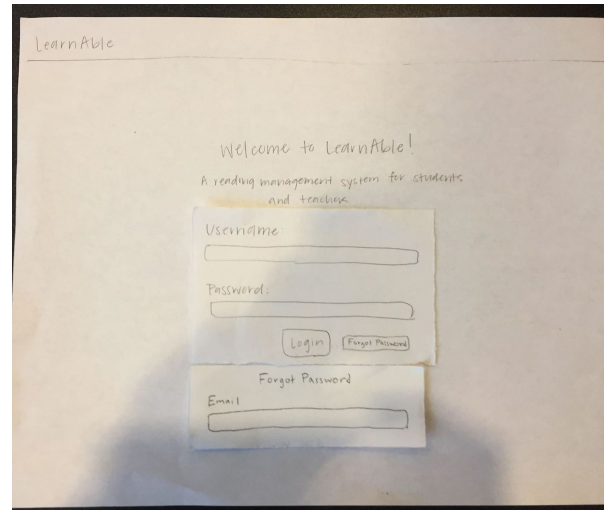
Figure 1.1: The teacher logs into LearnAble.

Figure 1.2: If the teacher forgets their password, they can request their login information to be sent to their email.

Figure 2: The teacher views a list of their students, with each student's reading level, readings in progress, and number of completed readings since last logins.
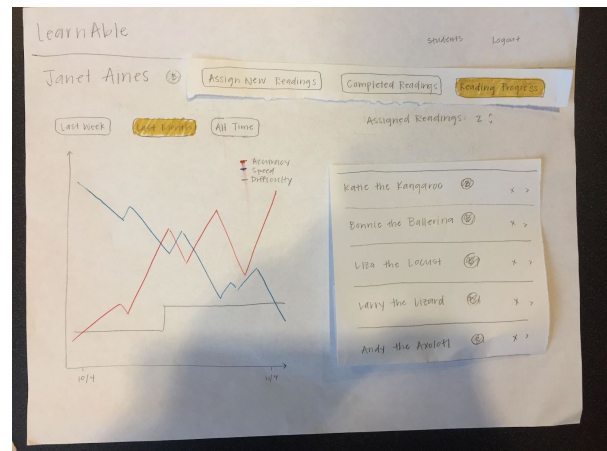

Figure 3.1: Once the teacher clicks on a student, LearnAble takes the teacher directly to the student's reading progress page, which displays the student's progress as a graph (default to last month), their assigned readings, and the number of required readings. The teacher can also view the student's progress for just one week or all time.
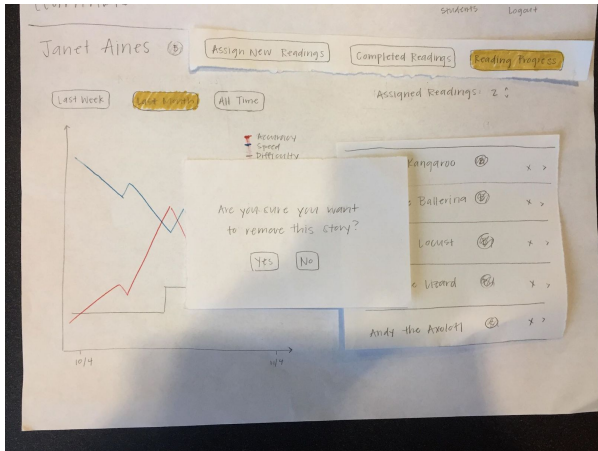
Figure 3.2: The teacher can remove an assigned reading, which takes them to a dialog box to confirm removal.
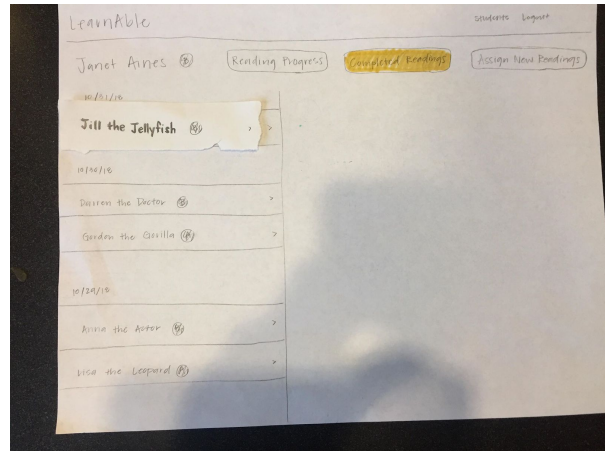
Figure 4.1: The teacher can also view the student's completed readings, which lists the readings in reverse chronological order. Any readings that the teacher has not reviewed yet are bolded.
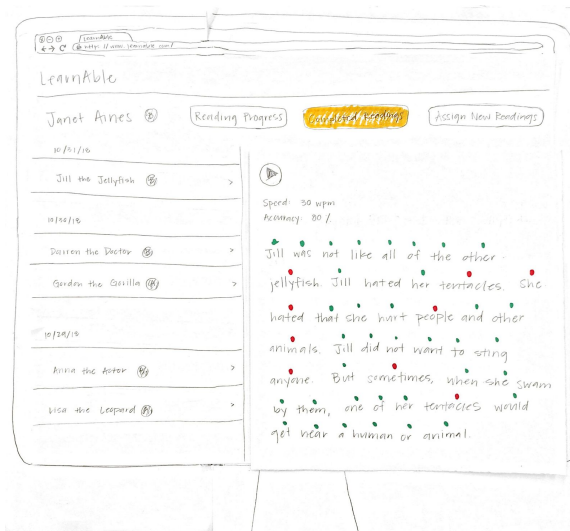
Figure 4.2: The teacher can click on a reading to view the reading text, along with dots denoting which words the student read correctly (green) and incorrectly (red).
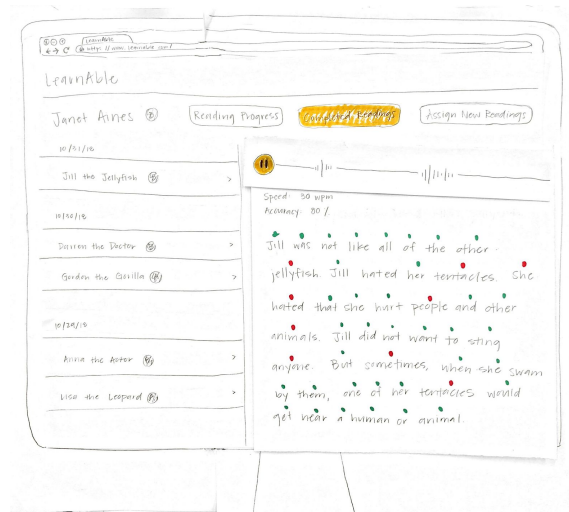

Figure 4.3: The teacher can listen to the recorded audio of the student's reading by clicking the play button.

Task 2: Select engaging reading assignments at an appropriate level
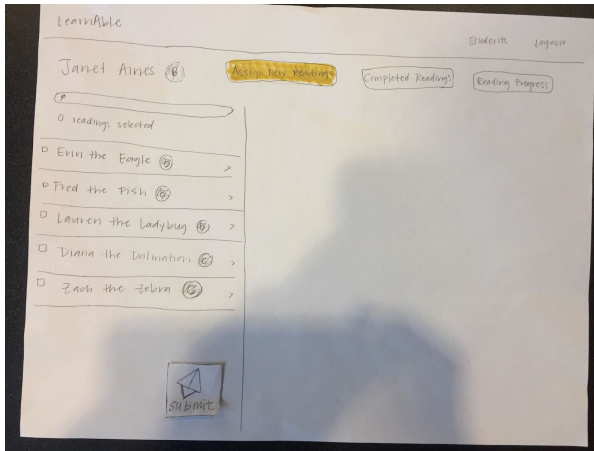
Figure 5.1: The teacher can view a list of readings that are around the same reading level as the student, sorted by increasing complexity. Each reading has a checkbox, which can be selected to assign the reading.
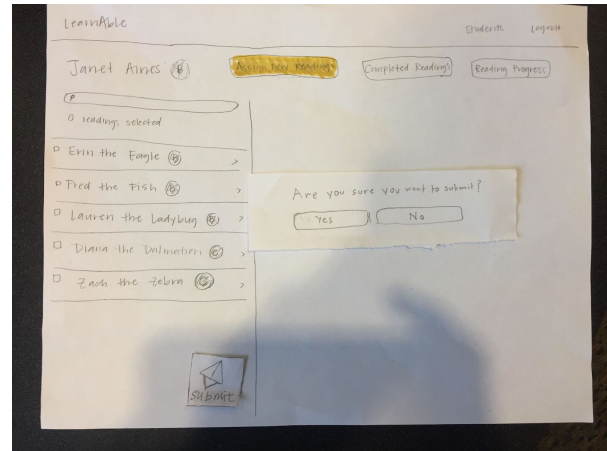

Figure 5.2: The teacher can submit the selected readings, which takes them to a dialog box to confirm submission.
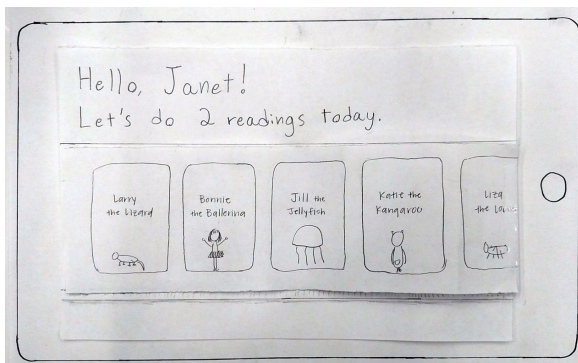

Figure 6: Upon student login, LearnAble takes the student to their bookshelf page. The bookshelf displays the number of readings the student should complete, as well as a gallery of book covers to represent their assigned readings.
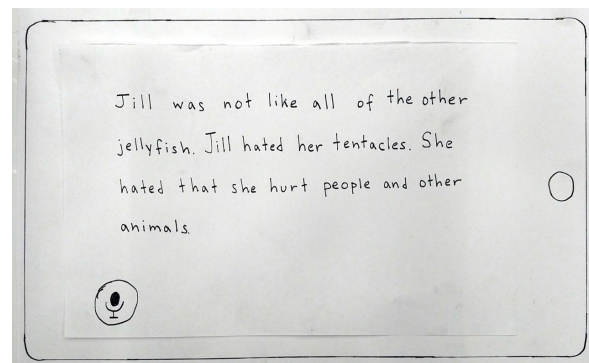
Figure 7.1: The student chooses a reading, which displays the reading text and a button for recording.
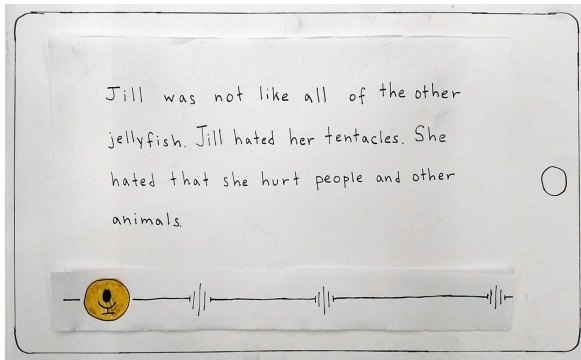
Figure 7.2: The student hits the record button and begins reading out loud. As the student reads, a dot appears above each word to indicate that LearnAble has processed that word as being read.
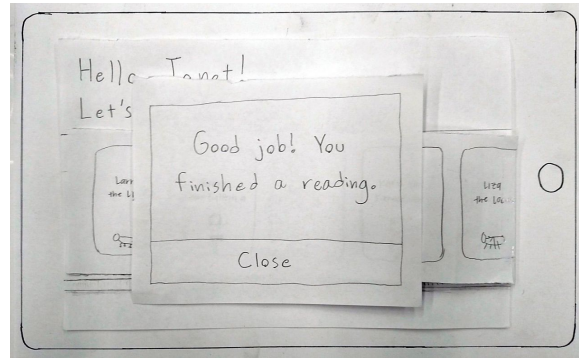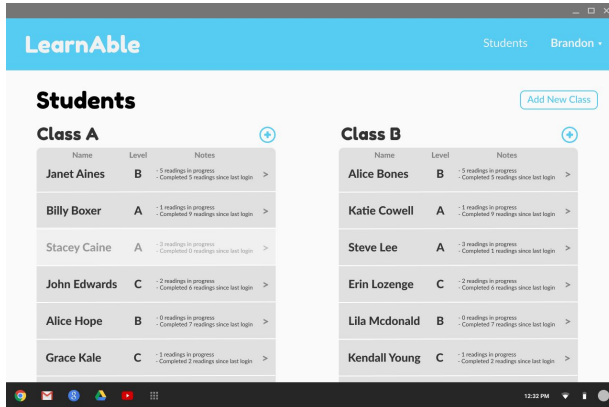

Figure 8: After the reading is completed, the student submits the reading and LearnAble takes them back to their bookshelf page. A dialog box tells them that the reading has been completed, and it has been sent to the teacher.
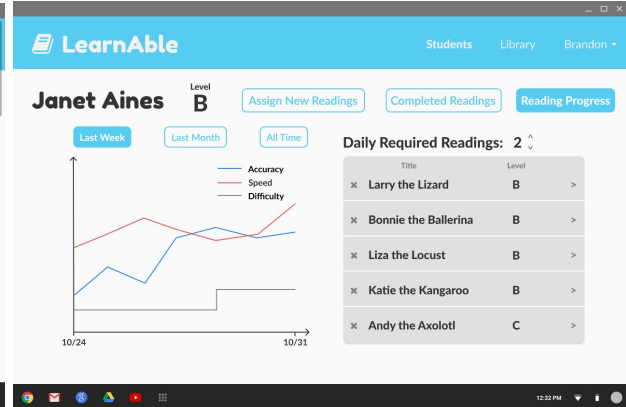
Digital Mockup

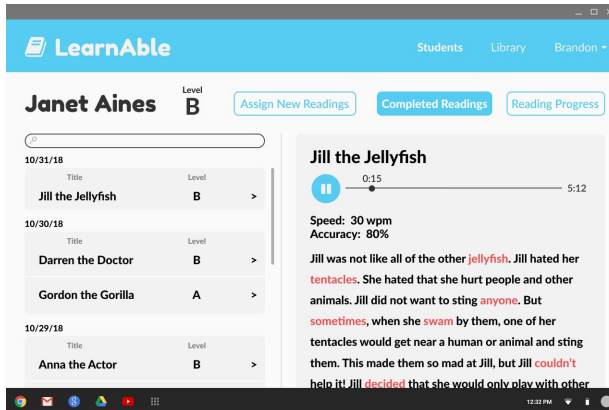### Task 1: Select engaging reading assignments at an appropriate level
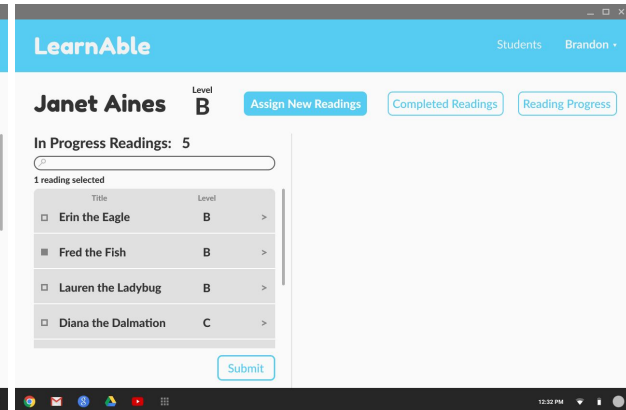
Class Overview

Reading Progress

Completed Readings


Assign New Readings

Our design allows teachers to view the progress of all of their students on the Class Overview page, showing how many readings they have yet to finish and how many readings they've completed since the teacher's last login. The teacher can view detailed progress on individual students on the Reading Progress page, with a graph of reading accuracy, speed, and difficulty over time. On the Completed Readings page, the teacher can listen to a student's readings and see which words they mispronounced highlighted in red. They can use this information to decide which readings to assign on the Assign New Readings page, which automatically shows new readings near the student's reading level.

Task 2: Record and transcribe audio of reading out loud

Reading Selection
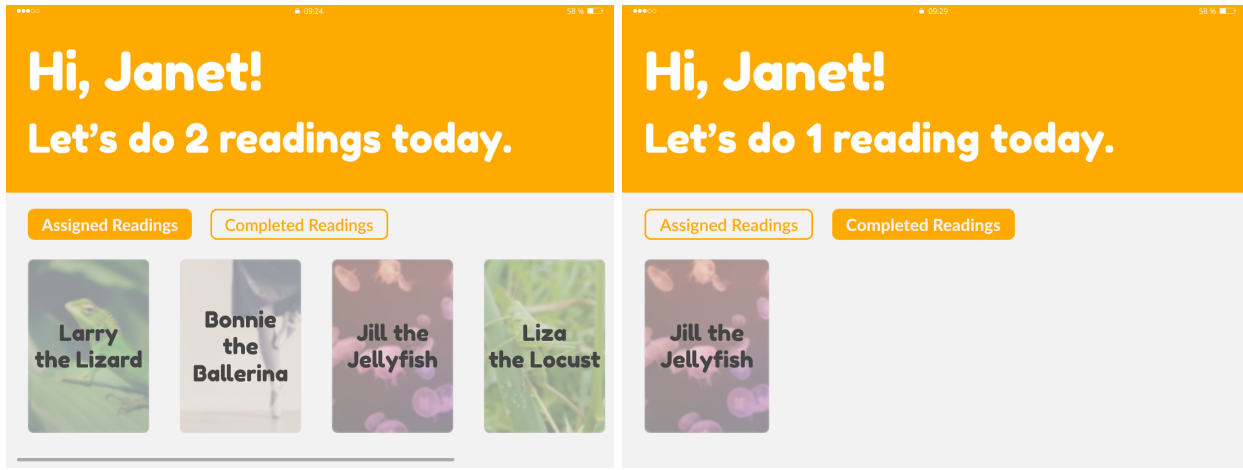
Recording Reading
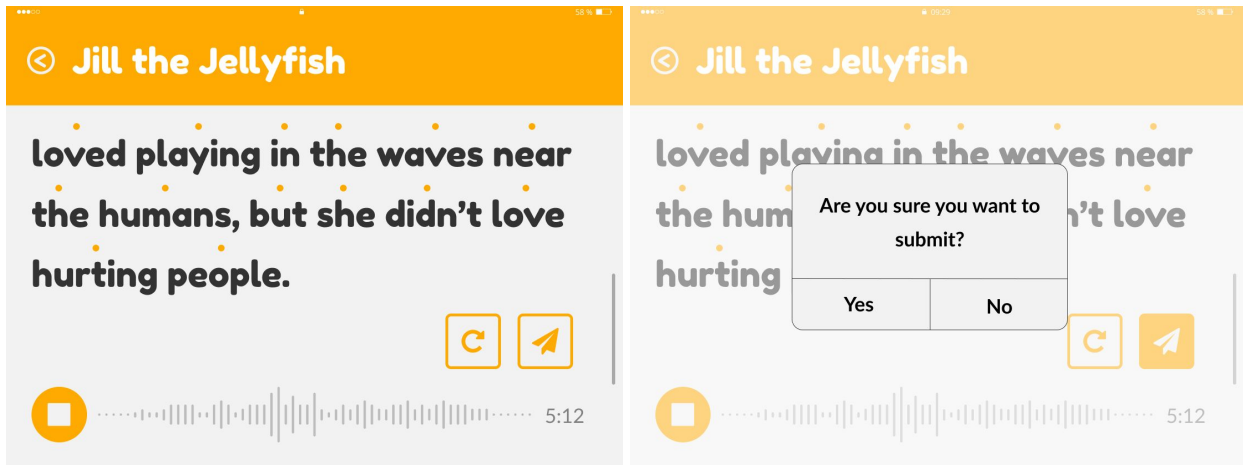
After student login in, LearnAble will take the student to their bookshelf page. The bookshelf displays the number of readings the student should complete, as well as a gallery of book covers to represent their assigned readings. (In the Completed Readings tab, the student can return to any readings they have already completed.) The student chooses a reading, which displays the reading text and a button for recording (the microphone). The student hits the record button and begins reading out loud. As the student reads, a dot appears above each word to indicate that LearnAble has processed that word as being read. When the student finishes their recording, two buttons appear to let them submit the recording to their teacher or start the recording over.

Changes

We made several design changes in implementation based on usability tests. While originally the complexity scores were just a guideline, they are now an integrated part of the LearnAble system that pushes certain readings to teachers based on a machine learning model that monitors students' progress. Dots now appear above words when a student is reading to provide instant feedback that the recording has been received.

While creating our digital prototype, we needed to add more colors to our digital mockup (and be consistent about our use of colors) as well as choose better icons for our buttons. We also decided to clarify some parts of the interface, like the ambiguous vertical axis for the student progress graph.

Discussion

The first thing we learned from the process is that in order to come up with a better final design, it is necessary to produce a large quantity of design ideas. This approach helped us add necessary features and lay out a foundational plan that improved the quality of our design later on. Thus, if we could have generated even more iterations of our design we gladly would have done so to create an even more refined design. We also learned from the process how to filter out redundant designs based on our task performance. By focusing our design on the achievement of just two tasks, ruling out unneeded features was straightforward and easy to visualize. For example, our first design forced teachers to make skill level judgements of their students, but we soon realized that it would be easier for all parties to compute this behind the scenes.

Next, we asked professionals for usability test. This is when we learned that a good interface should make users to get started easily. While we are designing, we think that we have covered all cases. However, only the users know what is missing. From either the in-class activity or extra usability testing, we have realized that we cannot expect users think the way we think because they are not familiar with our design. Therefore, users often times get confused about each interface mean, while we thought it is not an issue.

Finally, after all the revision from all kinds of suggestions, we are able to make very outstanding design. Even though the design still has improvement space, but we want to focus more on the majority. Therefore, we could not help to fix or change features that most users are fine with it because there is no such design that could satisfied with everyone.

During the process we have come up with multiple tasks, and we have picked two out of it as our primary tasks. We did not change our tasked, but instead of we removed some task performance due to hard implementation. We also add some small tasks from the suggestions of usability tests to help users do not get confused about our interface.

We do think we could have used more iterations upon our design because we are focusing on a special group of people. As a result, we do not have much perspective in order to improve our design. We believe more information the better design; however, we do not have enough time to gather as much information as possible. Therefore, even though we are satisfied with our design, but it still can be improved.

Appendix

Usability Testing Protocols

We had Katherine perform the following the two tasks for teachers by guiding her through subtasks:
1. Monitor student reading progress remotely
   a. View Janet's information. What is Janet's current reading level?
   b. How did Janet's difficulty level change over the past week?
   c. View Janet's completed readings. Which did she finish most recently?
   d. View Janet's most recent reading. What is her accuracy level?
   e. Listen to Janet reading "Jill the Jellyfish" out loud.
2. Select engaging reading assignments at an appropriate level
   a. Assign a new reading for Janet. Which reading would you select to match Janet's level? Which reading would you select to challenge Janet?
   b. Assign "Fred the Fish" to Janet.
   c. How many readings should Janet complete today? Change that number to 1.

We guided John Doe through the two protocols below:
Testing Protocol for the Teacher's Interface:
1. Monitor student reading progress remotely
   a. Can you view Janet Aines's profile?
      i. What stands out to you at first glance?
   b. How did Janet perform on her attempt of "Jill the Jellyfish?" Listen to her voice recording.
2. Select engaging reading assignments at an appropriate level
   a. Delete a reading.
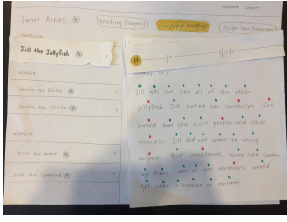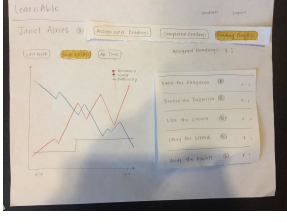   i. Any thoughts on this process?
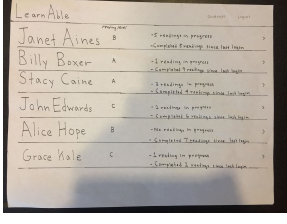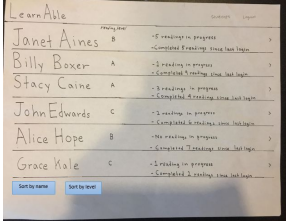Testing Protocol for the Student's Interface:
1. Select engaging reading assignments at an appropriate level
   a. Pick a story from the library to read. How does it feel to scroll through the different readings?
   b. Record yourself reading aloud. Pause the recording, then resume. Submit your attempt.
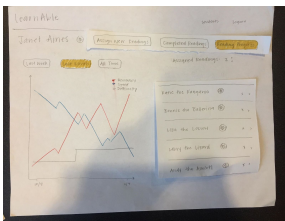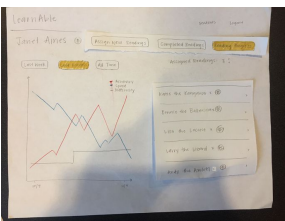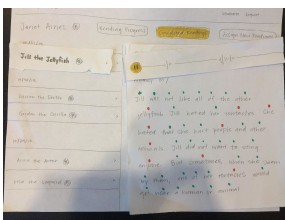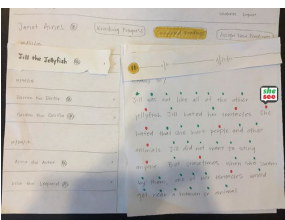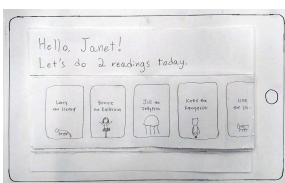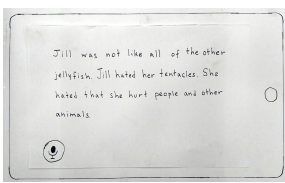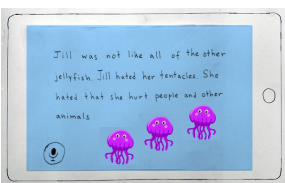   i. Any thoughts on this process?
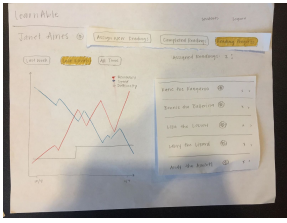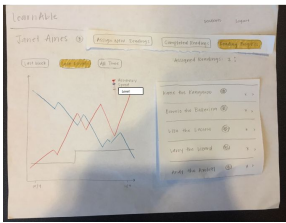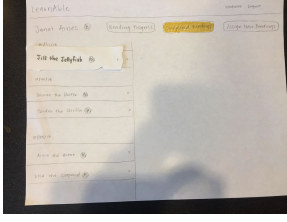
We guided Richard through the protocol below:
Testing Protocol for the Student's Interface:
1. Select engaging reading assignments at an appropriate level
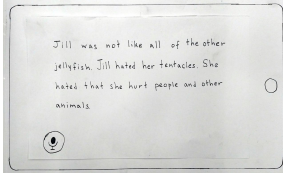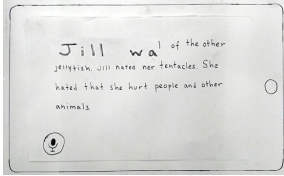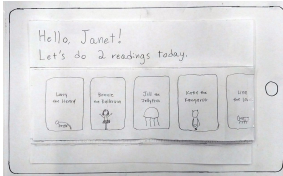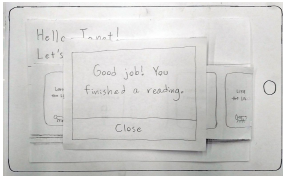   a. Assume the role of a dyslexic preschooler.
      i. Pick a story from the library to read. How does it feel to scroll through the different readings?
      ii. Read aloud the story. Then submit it.
      iii. Close out of the "finished a reading" pop-up.
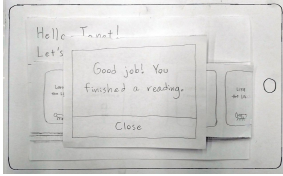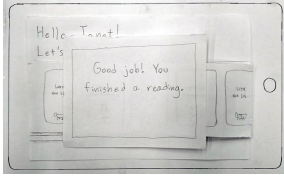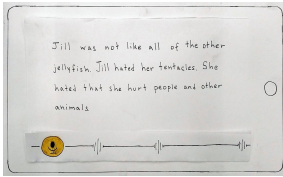
Results

Original Image	Incident	Fix	Fixed Image
	Negative Severity: 3 Circle indicating student's reading level is not intuitive.	Explicitly use the word "level" when levels are displayed.	
	Positive Completed readings listed in reverse chronological order breaks up the list in an easy-to-understand manner.	N/A	N/A
	Positive Meaning of green and red dots are intuitive.	N/A	N/A
	Negative Severity: 3 Number next to "Assigned Readings" does not match number of readings assigned.	Display both the number of readings required of the student (editable) and the number of assigned readings (not editable).	
	Negative Severity: 1 It is not possible to view the list of students in any other order than alphabetical.	Allow sorting by column for both name and reading level.	

Original Image	Incident	Fix	Fixed Image
	Negative Severity: 2 "X" button is too close to ">" button, running the risk of misclicking. It is also not intuitive what the "X" button does exactly.	Move the "X" button next to the story title. This makes it clearer what the button does and makes more sense spatially (lesser chance of misclicking).	
	Negative Severity: 1 The green and red dots give off a false impression that they are clickable.	The green and red dots can display detailed information about each word pronunciation.	
	Positive The student bookshelf interface is very welcoming and unintimidating.	N/A	N/A
	Negative Severity: 1 The reading interface is bland and uninviting; it might not appeal to the target demographic.	Add colors and pictures to make the experience more enjoyable for children.	

Original Image	Incident	Fix	Fixed Image
	Negative **Severity:** 1 The close button on the finished reading screen seems like needless functionality for a target audience of young children.	Simplify the popup by making it last for a fixed number of seconds. Remove the close button.	
	Positive Microphone recording feature is intuitive.	N/A	N/A
	Negative **Severity:** 3 Children with dyslexia may need to zoom into the text significantly.	Add a distinct zoom-in feature, activated by moving your finger along the specified text.	
	Positive Bookshelf should be very easy to use for young kids.	N/A	N/A
	Negative **Severity:** 3 Reward is somewhat lackluster. It should target multiple senses.	Add a positive sound effect for future motivation.	