LookUp

Low Fidelity Prototyping and User Testing Report

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Roles

Group Manager - Angie Zhu
Design - Happy Dong
Documentation - Tim Clark
Testing - David Truong

Problem and Solution Overview

Research has shown that there a strong correlation between the amount of understood words in a reading and the reader's comprehension. With that said, it is currently difficult and inconvenient to look up words and concepts during reading, especially for readers that are learning English as a second language. This usually means either getting a dictionary or using the Internet. The inconvenience is great enough that readers often ignore words which reduces overall reading comprehension.

We propose a mobile application that will integrate the look up experience with the reading itself. This application would overlay directly on the reader's text and provide an easy and convenient interface for quickly getting to this unknown information. This application would not only allow look up, but would facilitate history and quiz features. For ESL readers, this would not only allow greater reading comprehension but an increased vocabulary and understanding of the English language.

Paper Prototype Description

NOTE: The Paper Prototype we used for our Low Fidelity Prototype testing is actually designed on the computer (using PowerPoint), as it allows for more flexibility when it comes time to update and make changes (the designer works faster on the computer, and the TAs thought that digital prototypes would work as long as they were low fidelity enough and not super polished. We also made sure to note to the participants that these designs were easily changed and did not take us long to create).

Main Functionalities

Running and stopping the app

To launch the app, the user can tap on the app's icon in the iPad home screen. This will launch the LookUp bar on the top of the screen (fig. 1), which can be tapped to expand and collapse. When expanded, the LookUp bar will expand into a menu that contains three options (fig. 2):

1. Stop - Tapping on this will stop the app from running and dismiss the LookUp bar.
2. History - Tapping on this will take the user to the history page where he/she can view the history of all the words he/she looked up.
3. Quiz - Tapping on this will take the user to the quiz page where he/she can quiz himself/herself on the words he/she looked up.
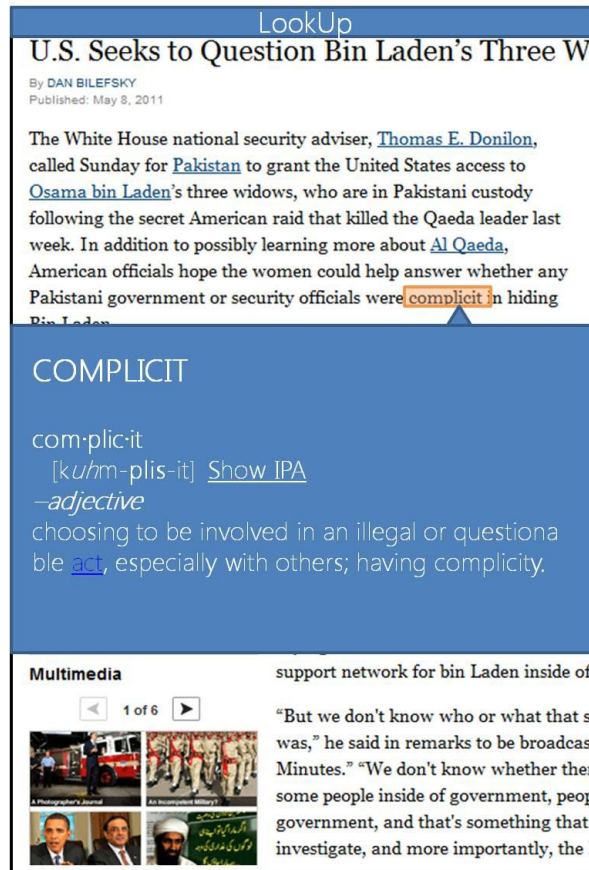

fig. 1   fig. 2

Looking Up A Word

Whenever the user is reading, he/she can simply press and hold on a word to invoke the definition pane (fig. 3) which will contain the definition of the word (and automatically stores the word in the history). Tapping outside of the definition pane dismisses it.

fig. 3

Viewing History

The History Page contains three tabs which cover different ways the user can view/categorize the words. Each tab is scrollable, and users can simply tap on the word to view its definition pane (fig. 6):

> 1. <u>All</u> - All words that the user looked up are ordered alphabetically (fig. 5)
> 2. <u>Date</u> - Words are ordered by recentness and organized into buckets of month-long periods
> 3. <u>Source</u> - Words are categorized under the source from which they were looked up. Sources are ordered alphabetically.
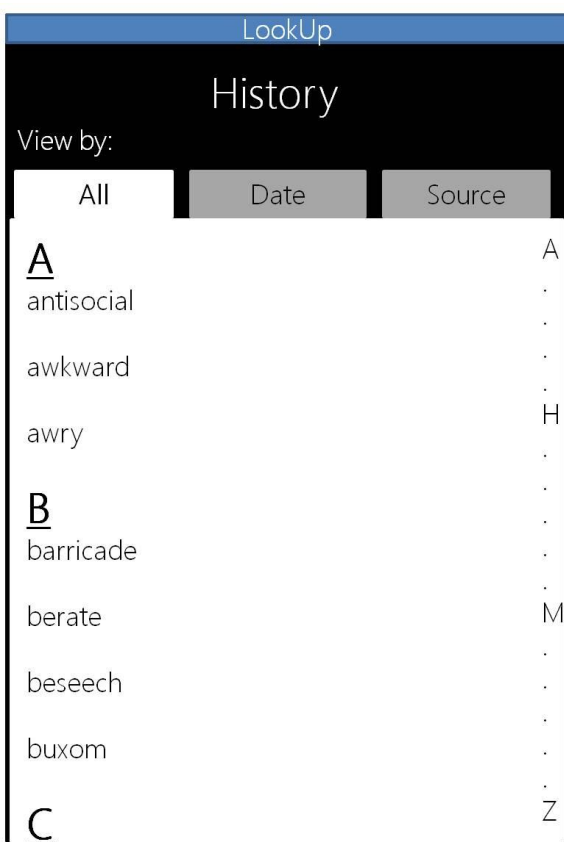
fig. 5

fig. 6

Quizzing/Learning Words

The Quiz Page contains three tabs denoting three different types of quizzes. Each tab has a back and forward arrow which allows the user to view previous quizzed words and proceed to the next word (tapping on the next arrow is the only way for the user to view the next word to be quizzed):

> 1. FlashCard - The definition of the word is shown, and the word itself is hidden behind a button labeled "Show Word" (fig. 7). Tapping on "Show Word" reveals the word (fig. 8).
>
> 2. Multiple Choice - The definition of the word is shown, and beneath are four choices (labeled a-d) which the user can select from. There is only one correct answer. If the user selects the correct word, they are notified of their success. If the user selects the wrong word, they are notified of their error and can try again. (fig. 9)
>
> 3. Fill-in-the-blanks - This is essentially a screenshot of the original source from which the user has looked up words, except the words the user has looked up are hidden behind solid rectangles. Tapping on the rectangle will reveal the word hidden underneath. (fig. 10)

LookUp

Quiz

| FlashCard | Multiple Choice | Fill in the Blanks |

SHOW WORD

DEFINITION:
choosing to be involved in an illegal or questionable act, especially with others; having complicity.

◄ ►

LookUp

Quiz

| FlashCard | Multiple Choice | Fill in the Blanks |

COMPLICIT

DEFINITION:
choosing to be involved in an illegal or questionable act, especially with others; having complicity.

◄ ►
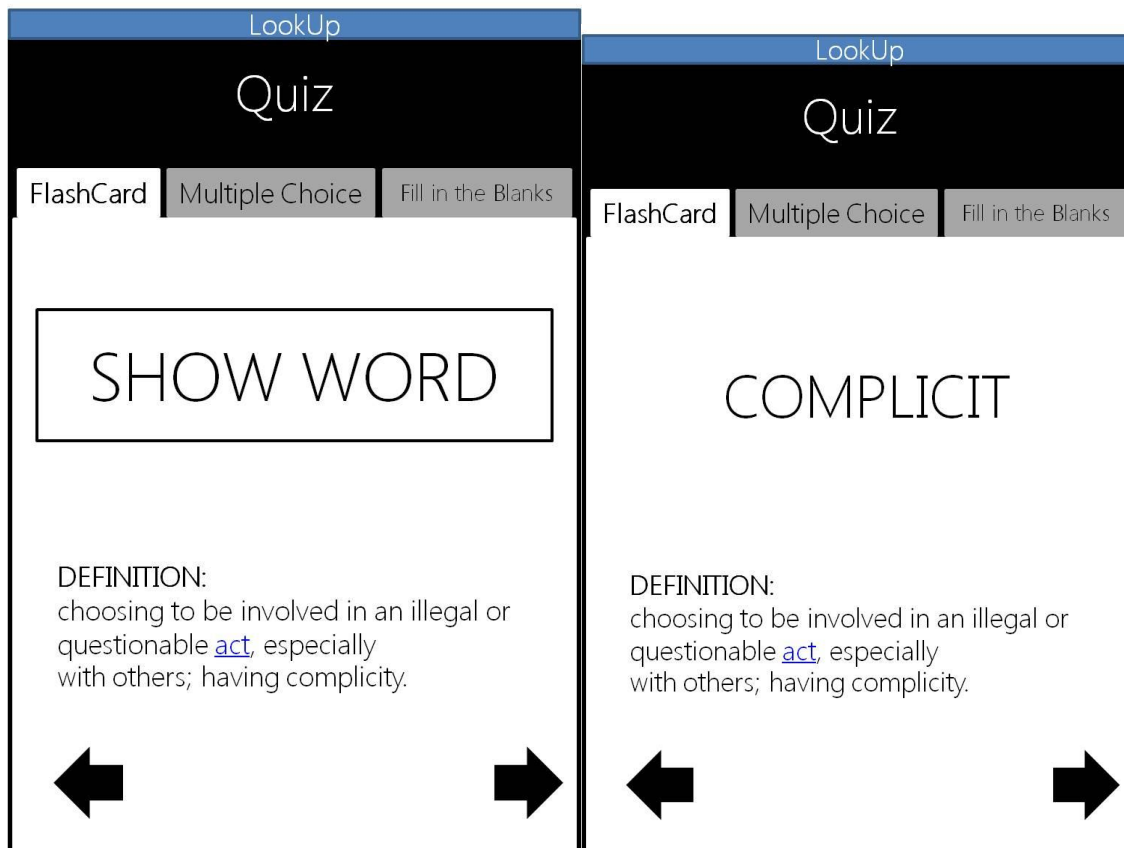
fig. 7
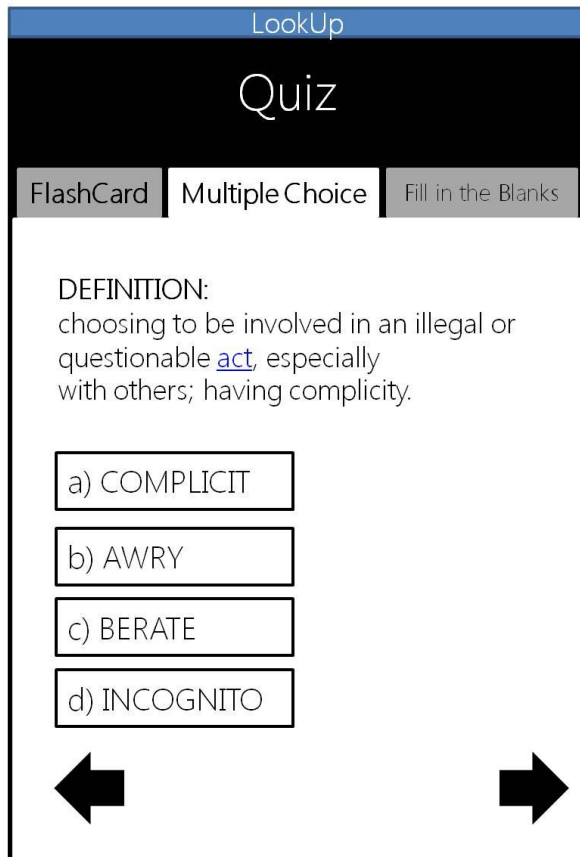
fig. 8

fig. 9
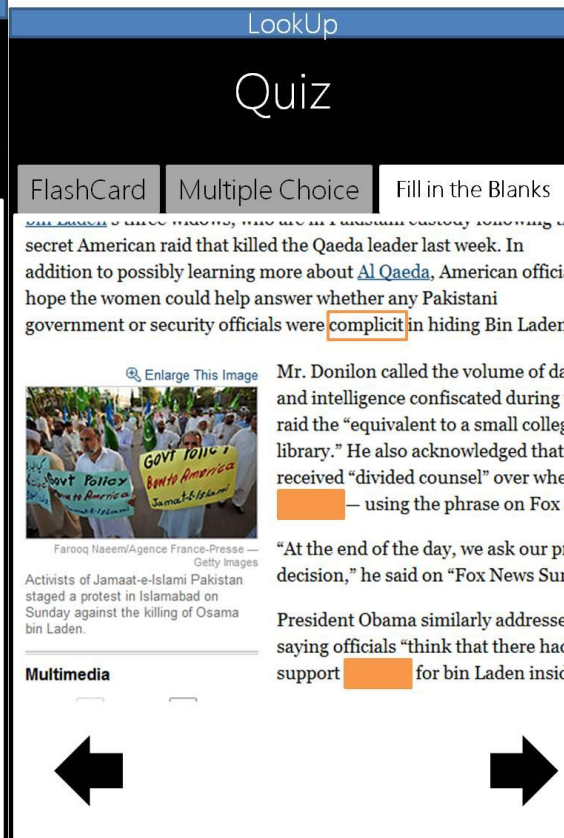
fig. 10

Main Interaction Ideas

Running in the background (LookUp bar)

We wanted the app to be unobtrusive and serve as an educational supplement to whatever the user is reading on the iPad, so we designed the LookUp bar. It allows the app to run in the background while at the same time giving the user the option to access the app's different functionalities (by expanding the LookUp bar). The LookUp bar is also a good indicator that the app is currently running.

Tabs

Both the History and Quiz page are organized into three tabs each. We decided that tab interaction was an efficient way to expose all the different components of a page without requiring the user to flip through too many different pages.

How Does a Person Operate it?

A person can operate our app the same way he/she would operate a traditional iPad app. Our app does introduce a few new concepts:

- Pressing + tapping on a word invokes the definition pane
- Tapping on the LookUp bar will expand/collapse it. (Usually iPad apps do not have a permanent bar or icon that appears all the time while other apps are running, but we decided to be creative and use this "imaginary" functionality anyway)
- Rather than having a full-screen "home screen" for our app, we took a suggestion from the TAs to simplify the design and integrate the homescreen with the LookUp bar, as the homescreen only had 2-3 options.

Testing Method

Participants

From the combined results of our contextual inquiry and task analysis, we have identified the target audience of LookUp to be ESL students, people who are learning English as a second language. Since the University of Washington is a highly diversified university, there are many international students on campus. We decided to visit Odegaard Undergraduate Library to find potential candidates for our low-fidelity prototype testing.

Participant 1 is a female international student from China. She has only been in the United States for almost a year. She encounters new words on a daily basis. Expanding her English vocabulary remains one of her top academic priorities.

Participant 2 is a male student at University of Washington, majoring in sociology. Even though he speaks English fluently, he came from an ESL background since he was not born in the United States and his parents are first generation immigrants.

Participants 3 is a junior undergraduate student studying biochemistry. He is originally from Vietnam. He has been in the United States for over five years. Although he is mostly fluent in English, he expressed that he does encounter words that he does not know occasionally, especially in an academic setting.

Environment

We conducted our usability tests at the Odegaard Undergraduate Library. We chose this location simply because it was a convenient place for our participants since they were already there. We decided to search for participants in the computer area which was the non-quiet study area of the library. Also, there are tables at the library which provided a large-enough surface for us to manipulate our paper prototypes.

Tasks

Task 1 Simple Word Definition Lookup (easy)
You are reading an article in New York Times on your iPad. Soon you encounter some unfamiliar words. Please use LookUp to find the definitions of those words.

Task 2 Review History (medium)
It has been a few days since you read the New York Times article. Today you are talking to your friend about that article you read a few days ago. However, you want to explain to your friend a term in the article but you forgot the exact spelling and pronunciation of it. So instead of reading through the article again, you use LookUp's history feature to find previously looked up words.

Task 3 Quizzing (hard)
You have been using LookUp for a while, and you often use it to read your textbooks and look up unknown words that appear in the reading material. Imagine that you have a vocabulary test on next Monday. Use LookUp to quiz yourself on those words to prepare for this exam. Please explore different quiz mode to find the best way for you to study.

Procedure

For each usability testing session, David, Happy, and Tim took turns acting as the facilitator while the other two took detailed notes. Angie remained as the computer for all tests. We decided to rotate roles because different people might ask different questions so we could obtain a more in-depth and well-rounded result by adopting this method.

Before we started the actual usability test, the facilitator followed the script (See Appendix B) by first giving the participant an introduction of our project and the purpose of the prototype testing. The facilitator also requested each user to sign a consent form. Once the candidates agreed to serve as our user testing subjects, we showed them the paper prototype and explained to them that all user interactions will be played out by the computer, Angie.

We proceeded by asking each participant to accomplish three tasks using LookUp. We asked them to use the "think-aloud" method while interacting with the paper prototype. If they were confused or did not know what to do for a particular task, we asked them to tell us their expectations and predictions.

Finally, we concluded each session by thanking the participant for his/her time and efforts.

Test Measures

The primary goal for our usability test was to receive feedback on our user interface. During testing, we placed a big emphasis on user-friendliness and program intuitiveness. Whenever the user became confused or hesitant to do a task, we asked them questions such as "What do you think you should do next?", "What do you think will happen if you press X?", etc. By asking such questions, we hope to learn more about the "natural" way for users to accomplish a goal. We carefully documented breakdowns each user had while interacting with our low-fidelity prototype. Furthermore, we asked general questions regarding their language acquisition process and suggestions that they could think of to improve our design.

Testing Results

From the prototype testing, we discovered many different flaws in our application which led to users not exactly understanding what they were to do at different times throughout the prototype test. These flaws were both large and small, some affecting every person who used

the application and some which were personal preferences. These results are listed by the area of the application in which they are found:

Application Launch (All tasks)

All of our participants were fairly confused by the launch scheme we chose. We had originally designed it to activate the LookUp bar when tapped, and then the application would be active in the background. The participants unanimously said that they would prefer a traditional "app-style" launch, where they would be taken to a home screen. We originally thought this would be an unnecessary extra step for the most common usage scenario.

Two of the participants did not notice the switch between the normal iPad home screen and that with the LookUp bar. This may have been due to the low contrast on the paper prototypes. The other participant did notice the addition of the bar, but was not sure exactly how to proceed from that point.

LookUp Menu (All tasks)

The LookUp menu that was expanded from the LookUp bar was also a fairly large source of confusion among the participants. The biggest issue was that participants did not know how to expand and get rid of the bar. Tapping the bar to expand it was not completely obvious. Additionally, there was no close button so one participant thought that the application stop button (which closed the background task) closed the menu. This would be a fairly big issue because the app would stop functioning as the user expected it to.

Definition Dialog Boxes (Tasks 1 and 2)

One participant made note of the fact that the definition dialogues were fairly limited in scale. The participant thought that additional features, such as pronunciations and uses in example sentences, would be more helpful in learning the words and how they should be used. As this participant was the least fluent in English, we thought that this was a fairly large usability issue.

History Sources Listing (Task 2)

The layout of the history "sources" tab was another issue, although it was not a major usability problem. Two participants attempted to click the source names that were headings for the list of words found in that source. They thought that this might take them to another page wherein they could view the complete word list for that source.

One of the two participants noted that he was concerned about the expandability of the source page. He thought that being able to expand the sources (which would default to hidden) to see all of the words listed would make navigating much faster.

Quizzing Word Choices (Task 3)

Our application originally had quizzing as an "automatic" selection of words that had been viewed. Two of our participants thought that, while this was convenient, it severely limited how they would prefer to learn words. Both of these participants wanted some option to choose word lists and customize what was being shown during the quizzes. That being said, the participants all liked the original idea of selecting words within these "lists" as a function of how often they were guessing incorrectly.

Interface Revision Sketches

In response to the confusion and critique from our low fidelity testing participants, we decided to make some changes and improvements to our design:

Landing screen in addition to LookUp bar - Now when the app is launched, the LookUp bar will initially be expanded form so that users will have a clear indication that the app is launched and running (the collapsed LookUp bar was less intrusive, but was not noticeable enough for first time users).

- LookUp bar has an arrow to show expandability - Many participants initially did not know that they could tap on the LookUp bar to expand it into a menu.

Expandable/scrollable definition pane - Some participants wanted to see more information about the word in addition to the definition, so we decided to make the definition pane expandable and scrollable to house more information.

- **Definition panel has an "X" to close it** - One participant was confused about how to dismiss the definition pane, so we introduced the familiar "X" on the upper right hand corner to make the process more obvious.

Expandable Alphabet/Date/Source names for History (collapsed by default) - One participant noted that if each source had many words under it, scrolling can be a hassle, so now source names are tappable/expandable, and will be collapsed by default. We applied the same theory to the All and Date tabs as well.

- **Date is sorted by recentness** - One participant noted that he'd like to see words he looked up in the previous day

FlashCard Improvement - Many participants complained about the limitations of the current FlashCard mode, which only allows the user to see the definition and guess the word. The participants said they usually go both ways when using flash cards to study (meaning, they also like the view the word and guess the definition), so we updated the design to accomodate that.

Customizable quiz buckets - One participant made a very useful comment about how he wants to study for one subject at a time or one specified "bucket" of words at a time rather than being randomly quizzed on all the words he's ever looked up, so the Quiz mode now has a landing page that first allows the user to customize which words he/she wants to be quizzed on.

Summary Discussion and Lessons Learned

In summary we were able to take away valuable lessons regarding our interface design of the application. From the prototype testing we were able to introduce out application and were able to gather users' opinions and comments on each of the features that we presented. The testing showed us certain aspects of our design which were not quite clear when trying to accomplish certain tasks. For instance when the application was initially started, user weren't certain how the application was run in the background. Initially when our application was started it only opened as a smaller dialog box rather than a full screen which was typical of other programs. Additionally the user didn't know that the application could be interacted with by sliding down on the progress bar. We learned that although many gestures and interactions were very intuitive to us, they were not to many of our users. Additionally we discovered that our interface lacked affordance to guide the user as to how to use our application. Our application did not have visual cues or clues to direct the user to interact with the application in certain ways. Throughout of user test, the users were uncertain of how to open up menus or to dismiss dialog boxes. If we included little arrows on the top bar slider to show that is can be pressed or slid. Also having x's in the corner of the dialogs would be additionally helpful for showing how to exit out of the definition screens.

Appendix A: Consent Form

The LookUp application is being produced as part of the coursework for the University of Washington Computer Science & Engineering course "CSE 440: Introduction to Human-Computer Interaction". Participants in experimental evaluation of the application provide data that is used to evaluate and modify the interface of LookUp. Data will be collected by interview, observation, and questionnaire.

Participation in this experiment is voluntary. Participants may withdraw themselves and their data at any time without fear of consequences. Concerns about the experiment may be discussed with the researchers Tim Clark, Happy Dong, David Truong, Angie Zhu or with Professor James Fogarty, the instructor of CSE 440:

James A. Fogarty
Computer Science & Engineering
University of Washington
206-685-8081
jfogarty at cs.washington.edu

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

I acknowledge that I have been given an opportunity to ask questions about the nature of the experiment and my participation in it. I give my consent to have data collected on my usage and opinions in relation to the LookUp experiment. I understand I may withdraw my permission at any time.

Name _____

Date _____

Signature_____

Witness Name _____

Witness signature_____

Appendix B: Script/Tasks

Introduction -
Hi my name is <Name>, we are currently creating an application to help users better learn the definition of unknown words. Have you ever been reading when you came across a word that you didn't know? What did you usually do when you came across this problem?

Well our application allows users to look up words directly on the screen while reading. Do you have a few minutes to help test out our application?

<Show the test participant the ipad design>

This is an example of our application which is called LookUp. There are three tasks that we will go over which vary in difficulty.

Task 1 - Simple Word Definition Lookup (easy)
The first task that we are going to go through is a definition look up of a word that you don't understand while reading.
Go ahead and open up the LookUp application from the home screen.
Now go ahead and open up a New York Times article from the safari web browser.
You are reading through the article and you come across the word <unknown word> and you don't know what it means.
How would you look up that word with the LookUp application?
Why did you do that to look up the word?
Now close out of the definition window and continue reading.

Task 2 Review History (medium)
You have just finished completed reading the New York Times article and are you are trying to explain a term to a friend but you don't remember exactly what the word is.
Rather than reading through the entire article searching for the word, you want to review all of the words that you have previously looked up from the New York Times article.

Now you also want to review a word that you previously looked up, but you don't remember the exact spelling of the word.

All you remember for sure is that words begins with the letter C and you know roughly how to pronounce it.

Try and find the word you are thinking of using the LookUp application.

Task 3 Quiz (Hard)

Imagine that you have now been using the application for a while and you now want to quiz yourself on words that have looked up for an upcoming vocabulary test.

Try out the different quiz features and just talk us through what you are doing in each of the quiz options.

Conclusion

Thank you for your help in testing our our new LookUp application. Do you have any additional comments or questions for us?

Appendix C: Raw Data

The following tables show the data we gathered during our prototype testing. The data are listed by participant (the numbers for which were randomly assigned and have no correlation to the order of introduced participants). Some of the incidents may be duplicates if they were noted by multiple participants. Each incident has a severity rating according to the following scale:

Severity	Meaning
0	Positive Incident/Don't agree this is a problem
1	Cosmetic problem
2	Minor usability problem
3	Major usability problem; important to fix
4	Usability catastrophe; imperitive fix

Additionally, as a reminder, our tasks listed in the results tables are as follows:
- Task 1 - Looking up the definition of a word in an online article.
- Task 2 - Finding the definition of a word by viewing the history
- Task 3 - Quizzing over words

Participant #1

Task	Severity	Details
1,2,3	3	Participant does not notice the LookUp bar on top of the screen after tapping on the icon in the homescreen (confused by the bar, not aware that the bar is expandable and indicates the app is running. She was looking for a homescreen/landing page that follows the pattern of most iPad apps)

1	2	Since participant is not a native English speaker, she would like to see more information regarding the word (such as the word used in example sentences, roots, pronunciation, etc.) in addition to its definition.
1	2	Participant was hesitant on knowing what to do in order to look up the definition of a word (press on word or press on the LookUp bar?). However, she pressed on the word by following her instincts.
2	0	Participant was slightly confused on the point of the task, but this was mostly due to vagueness during our explanation rather than a UI fault.
2	3	Participant kept on pressing LookUp icon instead of tapping on the LookUp bar (again, looking for a homescreen/landing page that follows the pattern of most iPad apps)
2	1	Selected "Source" tab without a problem, but thought the NYTimes header was clickable (which it isn't)
3	0	Selecting Quiz was very natural and straightforward; participant was not confused or puzzled by the purpose of "Quiz"
3	3	Participant was bit confused about being directly dropped into the FlashCard mode with the "quiz" already running. She was looking for a landing page/introduction first.
3	3	FlashCard - Did not immediately notice the definition, tapped "Show Word" a bit too fast (without reading the definition). Prefers an experience closer to real flashcards (meaning, hide the word and show definition in addition to hiding the definition and showing the word -- toggle style instead of just hiding the word).
3	2	Fill in the blanks - Participant prefers to type in the word that is being hidden and verifying that it matches the actual word (over just tapping on the hidden word to reveal it) because it reinforces spelling skills.

Participant #2

Task	Severity	Details
1,2,3	3	Participant didn't notice that the LookUp bar showed up upon app launch.
1	0	Participant assumed that the app also worked like a standard dictionary (instead of reading definitions).
1	2	Participant wondered why he had to activate the application when the launch seemed to have no other side effects, thought it was a wasted step.
1	3	Participant automatically attempted to click the passive LookUp bar when he found a word he did not know. Touching and holding the word was not made explicit enough.
1	2	Participant did not know how to expand and dismiss the LookUp bar
1	1	Participant noted that he might like an icon instead of the LookUp bar
2	2	Participant thought that the Stop button on the LookUp main menu dismissed the dialogue instead of quitting the application
2	2	Participant attempted to select the source headings in the "Source" history view. He thought they were links instead of merely headings to the actual word definitions.
2	0	Participant noted that he liked that the history was easy to access and had multiple search options.
2	0	Participant thought that "source" was a good word to describe sorting history by the title that the word came from.
2	0	Participant automatically tried to scroll through the history word listing (even though we did not have the ability to show scrolling in the paper prototype)
1,2,3	3	Participant noted that he wanted a standard launch screen when he clicks the LookUp app. He thought that having the title bar show up with no traditional launch screen was too different from how other apps normally function.

3	2	Noted that the options we had available for a multiple choice quiz were too difficult. This lead to him noting that he would like to able to customize the difficulty of the paired words on the quizzes in general.
3	2	Thought that all the blanks in the fill-in-the-word quiz style were the same word shown in different sentences. When he found out that they were all various words he had looked up, this confused him.
3	0	Thought fill in the blanks was a slightly too tedious quiz style
3	0	Participant noted that he liked our idea to implement "predictive quizzing".

Participant #3

Task	Severity	Details
1,2,3	3	Participant does not notice the LookUp bar on top of the screen after tapping on the icon in the homescreen (confused by the bar, not aware that the bar is expandable and indicates the app is running. He was looking for a homescreen/landing page that follows the pattern of most iPad apps)
1	0	Naturally knows to tap on word in order to look it up.
1	2	A bit confused on how to dismiss definition pane (perhaps an X on the upper right corner would be more helpful)
1	2	Participant is concerned about accidentally invoking definition pane when scrolling through the page (might accidentally tap on words), so he suggested pressing + holding as a gesture to invoke the definition pane.
2	2	Participant thought having a "recent" option in the history menu might be helpful. He thought it was different enough from "date" (which might be a long term search setting) to include.
2	2	Participant was concerned about a scenario where he had 100+ words for each source, and there would be too much scrolling involved - so he suggested the source names be clickable/expandable.

3	3	Participant wanted the ability to hear the pronunciation of a word within the application. He thought this would be critical in ensuring that he learned the word correctly (both in definition and in pronunciation).
3	3	Wanted the ability to customize the quizzing. He thought that throwing all the words together in the quiz would hamper his ability to use the app to learn the exact words that he wanted.
3	2	FlashCards - Should go both ways (meaning, have both the option of hiding the word/showing definition and hiding definition/showing word)
3	1	Thought typing in the name of the fill-in-the-blank quiz answer was too slow. Preferred to either have it just show up on click or have different options for guessing it.

Appendix D: Additional Questions

1. What year are you at the University of Washington?
2. What is your major?
3. Do you know any other languages?
    a. What is your primary language?
4. How do you normally learn new words?
5. How often do you encounter new words?
6. Was there anything non-intuitive for that task?
7. For flashcards, do you prefer looking at the definition first then guess the word? Or the other way around?
8. For filling in the blank questions, do you prefer typing the answer out or tap to see the answer?
9. Do you have other suggestions for our user interface?
10. Can you think of any additional feature that might be helpful for learning new words?