VocabRacer

CS 147, Winter 2021

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Table of Contents

1. Project Name and Value Proposition

Project Name

VocabRacer

Value Proposition

Learn a language. Have fun. Share with friends.

2. Team Members

Jonathan Kula, Designer/Developer [converts sleeplessness into code]

Shana Hadi, Designer/Developer [magic caffeine conversion machine]

Anand Shankar, Developer [Bai drinker]

Vivian Yang, Designer/Developer [cat]

3. Problem and Solution Overview

Mission Statement

We bring language learning into users' daily lives using their own everyday contexts and social networks!

Problem/Solution Overview

Problem: Language learners find creating vocabulary flashcards monotonous and unconnected to their daily lives. As a result, learners often neglect improving their vocabulary.

Solution: We make learning vocab fun, relevant, and effortless by auto-generating vocab units from user photos, linking their daily practice with their physical, visual, & social contexts.

4. Needfinding Interviews

Initially, we were deciding between two topics: educational productivity and language learning. Our initial needfinding interviews exposed that needs in the former topic tended

to focus more on productivity than education, whereas the latter topic was clearly focused on education. Therefore, we decided to focus on language learning.

We conducted six needfinding interviews that spanned current college students, high school students, professors, and grade-school teachers. Some of our interviewees study or work in engineering, others in the humanities, and others in both. Some of our interviewees use global languages in their studies and/or careers, and we strove to seek a variety of interviewees with diverse perspectives.

We learned a lot from our needfinding interviews. Our interviewees told us that they learn best when they have to use the target language; watching Netflix in German helped one person improve his German skills. At the same time, they described how it was frustrating that existing language-learning solutions felt scripted, inauthentic, irrelevant to their contexts, and not attuned to their specific goals, which was a great insight for us. However, despite wanting contextual immersion, they didn't always seriously seek it out. In addition, several interviewees reported that existing solutions failed to engage them, as they started learning a language for intrinsic reasons, but their motivations shifted over time to become more extrinsically focused. We learned that engagement is key to preventing attrition.

We've included an overall empathy map summarizing what we learned, along with an empathy map from one particularly insightful interview below.


SAY
"I learned German, Italian, and some romance languages to help with my thesis texts"
Measuring language proficiency: "Do I know how to say fork in this language?"
"The rat cooks a cake in the house"
"flexibility in tutoring services isn't as obvious online"
"I don't know when I'm burned out"
"Talking to someone else is a good foundation for finding new vocab"
Duolingo: "you learn bread before hello"
"Language classes across the board focus on speaking"
"the phrase 'I think that' is a good foundation for finding new vocab"
"I want to have intermediate knowledge in several languages for my career"
"YouTube: how to learn a language in 10 days"
THINK
structure timed and breaks
hands-on handwriting and speaking for practice / remembering
reading / listening to foreign languages in native contexts for depth
cost-benefit analysis for choosing lesson / tutors
in-person conversation / instruction is more conducive to learning
finding tutors / conversation partners is easier through existing social networks than online
loses interest if learning feels mass-produced
language learning also involves researching the culture
learn languages for your own interests (thesis, travel, translation, etc.)
Learning goals for mass-produced sites need to be direct, accessible, and reproducible
mass-produced sites often have non-natural practice phrases
DO
spends class time speaking
does vocab independently
Conversations via apps (strangers, prefer friends)
Duolingo, iTalki, HelloTalk, Kana
watches YouTube "how to speak" for pronunciation
spaces vocab repetition through flashcards
Go to library / outside the apartment to study
also studies the history of the language
use pen and paper for handwritten notes
immerses himself in foreign language newspapers and bulletins
scans his handwritten pages with kanji and scripts to upload for grading
times himself with the Pomodoro work/rest technique
Calendar is incomplete
whiteboard + markers
Put too much on todo list
FEEL
Zoom fatigue
online tools don't have the same satisfaction
frustrated at how easy it is to lose time
anxiety at needing to do everything
dislikes talking to randos
frustration at tech tools
distaste at bad pedagogical practices for language apps
focus!
not actually getting "hard" stuff done
appreciates paper and print

5. POVs & Experience Prototypes

Points Of View

To further our needfinding and to understand our users more, we interviewed more participants at a deeper level, focusing on formulating Points of View (POVs) for our potential users. Who really are our users? What does their life look like? What do they need? What would be game-changing for them, if only it existed?

From 6 individual interviews in this round, we drew insights and generalized our findings into POVs that represent the perspective of a group of potential users.

POV 1

First, we met **Happy Hummingbird** [names have been anonymized for privacy], a 17-year-old student studying French.
We were amazed to realize that they felt they lacked everyday communication skills since their program focused on formal, textbook French.
It would be game-changing to have a context-based language learning reinforcement system.

POV 2

Next, we met **Curious Crane**, a junior at UCR with a retail job.
We were amazed to realize that although she began learning languages for intrinsic reasons, she continued for a long time because of social pressure.
It would be game-changing to make use of changing motivations to encourage language learning.

POV 3

Finally, we met **Candid Caterpillar**, a 29-year-old startup founder from Sweden.
We were amazed to realize that learning about his girlfriend's language and culture is necessary for him to get close to his girlfriend's family.
It would be game-changing to create opportunities for individuals to connect with their (extended) families and culture.

How Might We?

Having gained a deeper understanding of our users' perspectives, the next questions we flared out in brainstorming were: **How Might We (HMW) materially improve our users' lives?**

HMW 1

From our conversation with **Happy Hummingbird**, we knew that in order to feel engaged and motivated, language learners needed to learn what feels relevant to them, instead of formal language that they will rarely use. Our brainstorm asked:

How Might We…

1. … get users to create a grab-bag of their commonly encountered contexts?
2. … incorporate text, color, and sound or digital aids to help with conjuring contexts during stay-at-home usage?
3. … tailor the user's favorite / most relevant contexts to actively affect their gameplay or activity?

Translatophone

We distilled our best insight from Happy Hummingbird: **HMW incorporate digital aids to help users create their own contexts, especially during stay-at-home usage?**

To address this need, we designed Translatophone, multi-modal multi-player social game which draws inspiration from the best parts of Pictionary and Telephone. The key assumption we wanted to test was how much embedding language learning in casual social activities would make it easy and fun to make mistakes and learn together. We facilitated the experience using Zoom and its digital whiteboard.

From testing Translatophone with 3 people, we learned that all participants enjoyed socializing, and our game was challenging enough to be engaging since participants had to actively create sentences. However, we needed to account for "social warmup": participants had to ease into the interaction, after which they felt comfortable making mistakes in front of each other.

HMW 2

Curious Crane expressed to us a common concern. It's easy to start something new, but how do you keep going when the rush of novelty inevitably fades? We asked ourselves:

How Might We…

1. … provide context that emphasizes the user's intrinsic interests?
2. … provide constructive social pressure to continue at scale?
3. … keep the initial intrinsic motivations in addition to the new extrinsic motivations?

VocabRacer

We distilled our best insight from Curious Crane: **HMW reliably emphasize the user's intrinsic & extrinsic interests to keep people engaged even as motivations change?**

For this insight, we designed VocabRacer**,** a competitive classroom game along the lines of Kahoot or Gimkit, with a language-focused twist: students identify objects in images using vocab words for points. We sought to combine intrinsic motivations (competitive spirit, enjoyment of language practice) and extrinsic motivations (social pressure for points). Our assumption here was that collaborative, competitive, content-focused play enhances classroom learning, in part because it leverages both intrinsic and extrinsic motivation.

This experience prototype was extremely well received by our 3 participants. Not only was our assumption validated, participants claimed that VocabRacer was "surprisingly effective at helping [them] recall vocab words", and "[they] wish they had this… in class".

HMW 3

Finally, Candid Caterpillar gave us great insights into the social reasons, communicative nature, and uniquely bonding moments of language learning. We brainstormed:

How Might We…

1. … leverage the language gap to create a bonding experience between a person and their significant other's family?
2. … encourage other speakers of the language to support or give low-stress feedback to the less-proficient speaker?
3. … help someone showcase their learning to others to foster closeness (their SO's family, their own family, wherever the language barrier exists)?

FriendTalk

We synthesized our learnings from Candid Caterpillar into the following question: **HMW leverage other language speakers in a low-stress situation to reduce the social awkwardness of language learning?**

To meet this need, we designed FriendTalk, a platform that allows you to find people learning or practicing the languages you are learning within your or your friends' social

networks. Our underlying assumption here is that people want to practice languages with people they already know.

We prototyped FriendTalk using Google Docs. We prototyped this via Google Docs. A user is presented with 4 other profiles: 2 people who they know and 2 strangers. They are then asked to pick 0, 1, or 2 people to practice languages with. Users were told that they would have a short language-learning conversation with the person or people they picked at some later date.

Name: Vivian Yang
Language(s): Chinese, French, Spanish (in order of proficiency)
Profile: Cats!

Participants largely validated our assumption: 3/4 testers chose 2 people they know. 1 tester chose 2 strangers. This experience prototype suggested that users may be decisive about their desires: they either want to learn with friends or with strangers, not a mix of both. In addition, testers really enjoyed both reading profiles and creating their own.

6. Design Evolution

Our Selected Solution: VocabRacer

Our value proposition encourages “having fun,” and our prior interviewees found image-centric multiplayer games engaging. We want to make language-learning accessible, and with an image-centric design focusing on linking vocab words with visual contexts, we can model language-learning as an immediately immersive experience for users.

We decided to create **VocabRacer**, a mobile application where you can take a picture, and the app will automatically generate vocab words directly on it. You can play games, share photos and track your progress all in one app! No matter where you are, you can start immersing yourself in a foreign language. Just snap, click, and learn how to say anything today!

Three Tasks

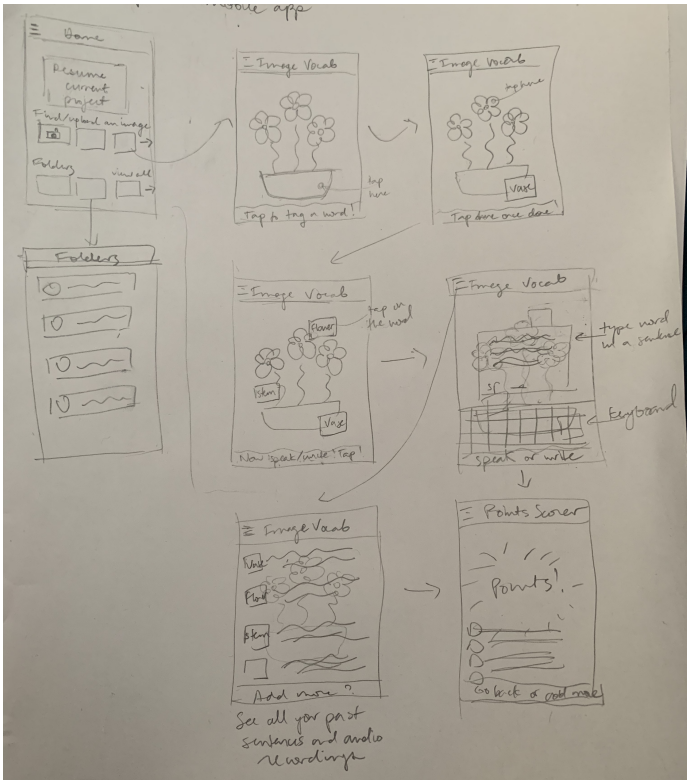
Task 1 (Simple): The user has a few minutes of free time and wants to do a productive yet low-effort vocab learning activity (e.g. simple vocab “sightseeing” drills).

Task 2 (Medium): The user is learning a whole context of vocab words (e.g. “everything clothing-related”) and wants to prove their progress to others (e.g. their teacher or peers) through competing in multiplayer “score and capture” games.

Task 3 (Hard): The user wants to go outside and explore unfamiliar contexts of vocab words (e.g. everything bank- and gym-related) as if they were immersing themselves in a foreign country and language, integrating their practice into a daily routine (e.g. with location-based sets and goals).

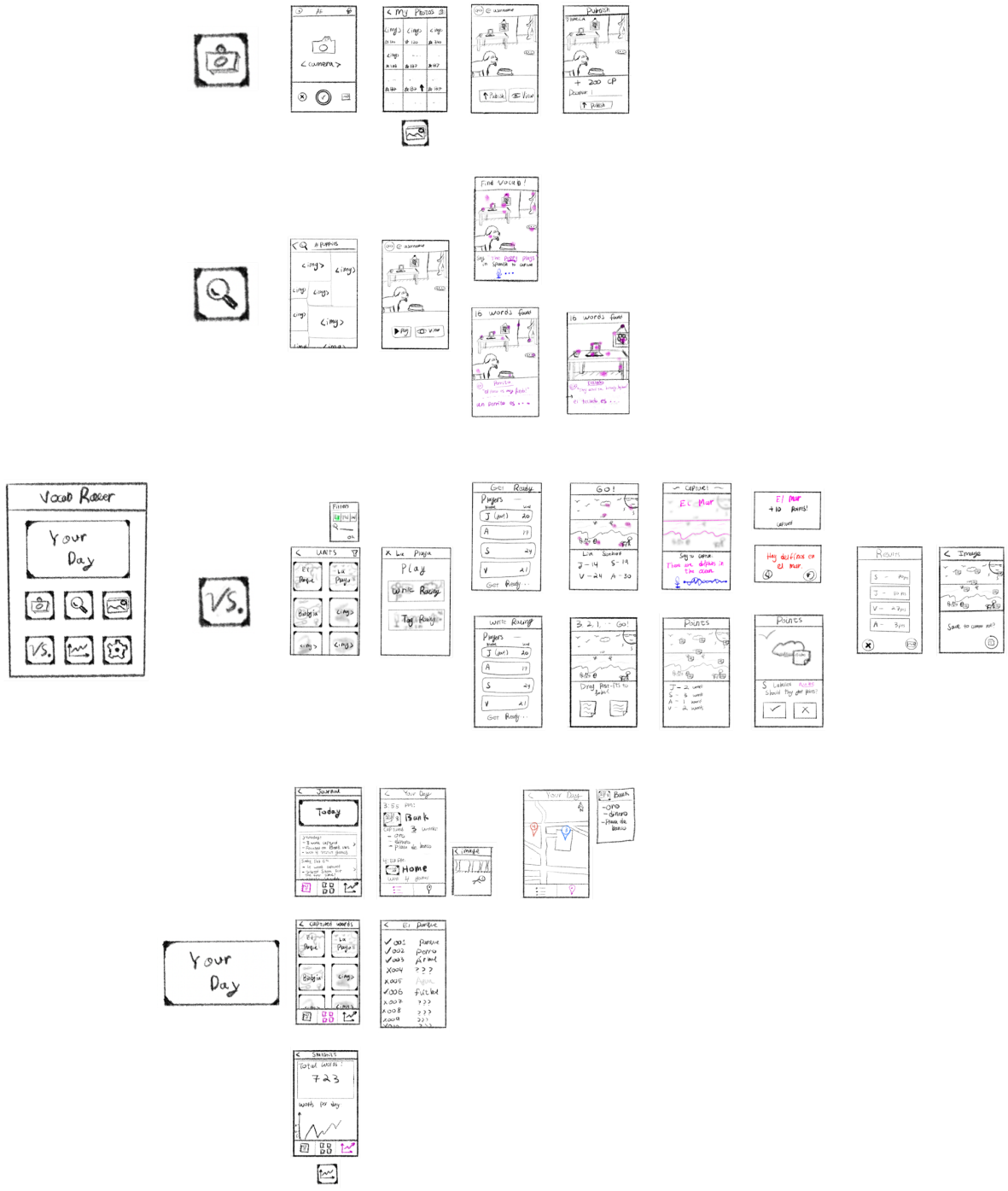
Our Design’s Evolution

Initial Sketches



“VocabRacer Tagger” allows users to share images on a social platform. They can learn image-linked vocabulary and compete in image-centric games.

Low-Fidelity Prototype



Initial Lo-Fi sketch and scene layout

Notes from our Lo-Fi Testing

Modifications and notes from our Lo-Fi testing

When testing our lo-fi prototype, our users noticed that some, but not all, of our screens had a back button on the top left corner. Although users might have felt comfortable if we were consistent either way, establishing the back button early and then being inconsistent

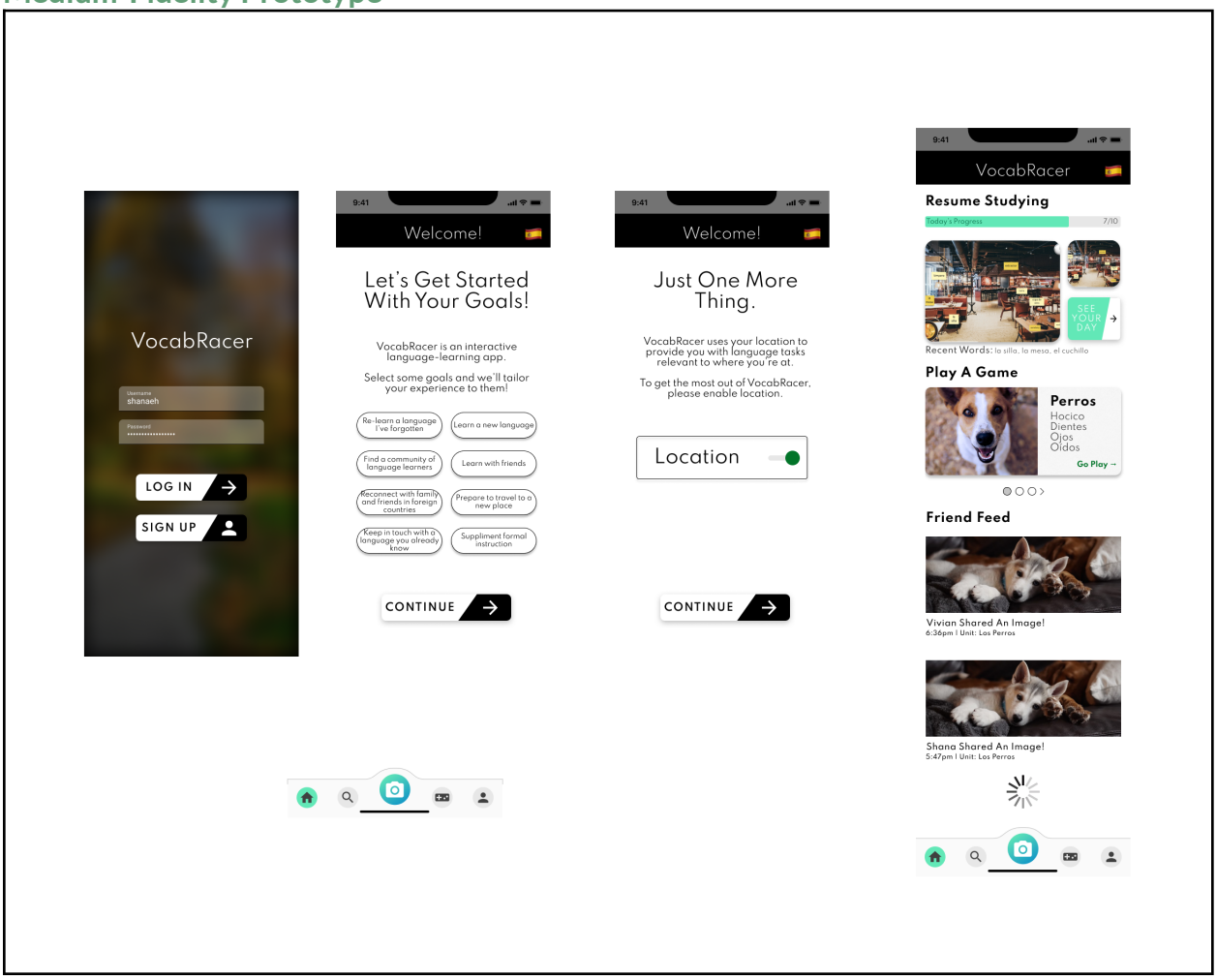
was confusing to all our interviewees.

Two participants commented that learning a word once does not mean it will stay learnt, making our "count of learned words" metric useless; so instead, we leaned more towards stats about usage of the app over time as a proxy for consistency in language-learning.

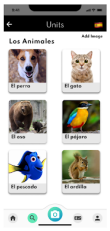
Additionally, some users found our home screen layout confusing. We switched to a tabbed navigation paradigm, which flowed much better during med-fi testing.

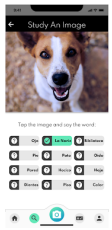
Finally, all three users needed additional instructions to play the games. Once they understood the objective, all three users found the games exciting, though one participant provided the caveat that they think the games are better for younger people learning casually. We added more instructions and ensured that our designs were more suggestive to the users of what to do.

Medium-Fidelity Prototype



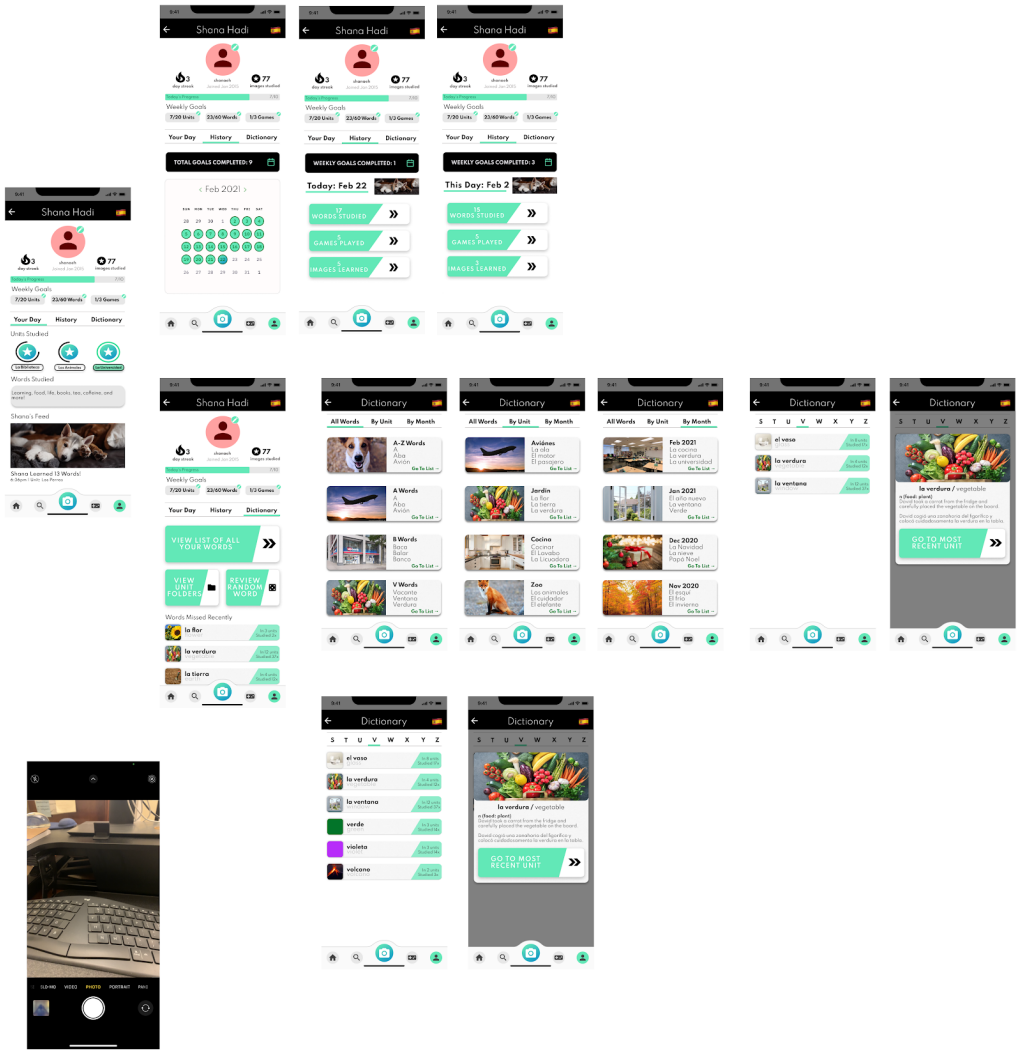
Med-Fi Prototype, Onboarding + Home





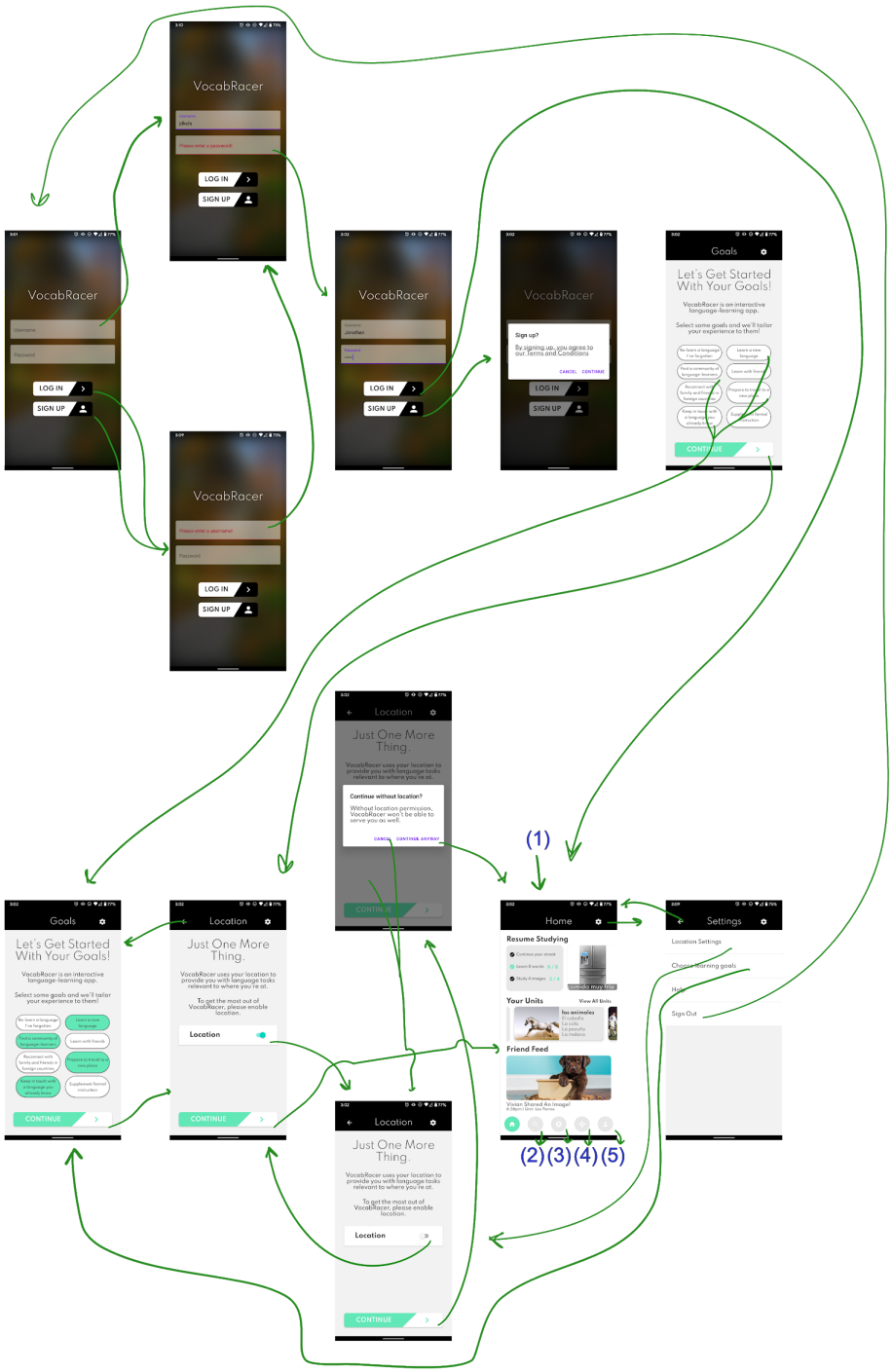
Med-Fi Prototype, Task 1

Med-Fi Prototype, Task 2

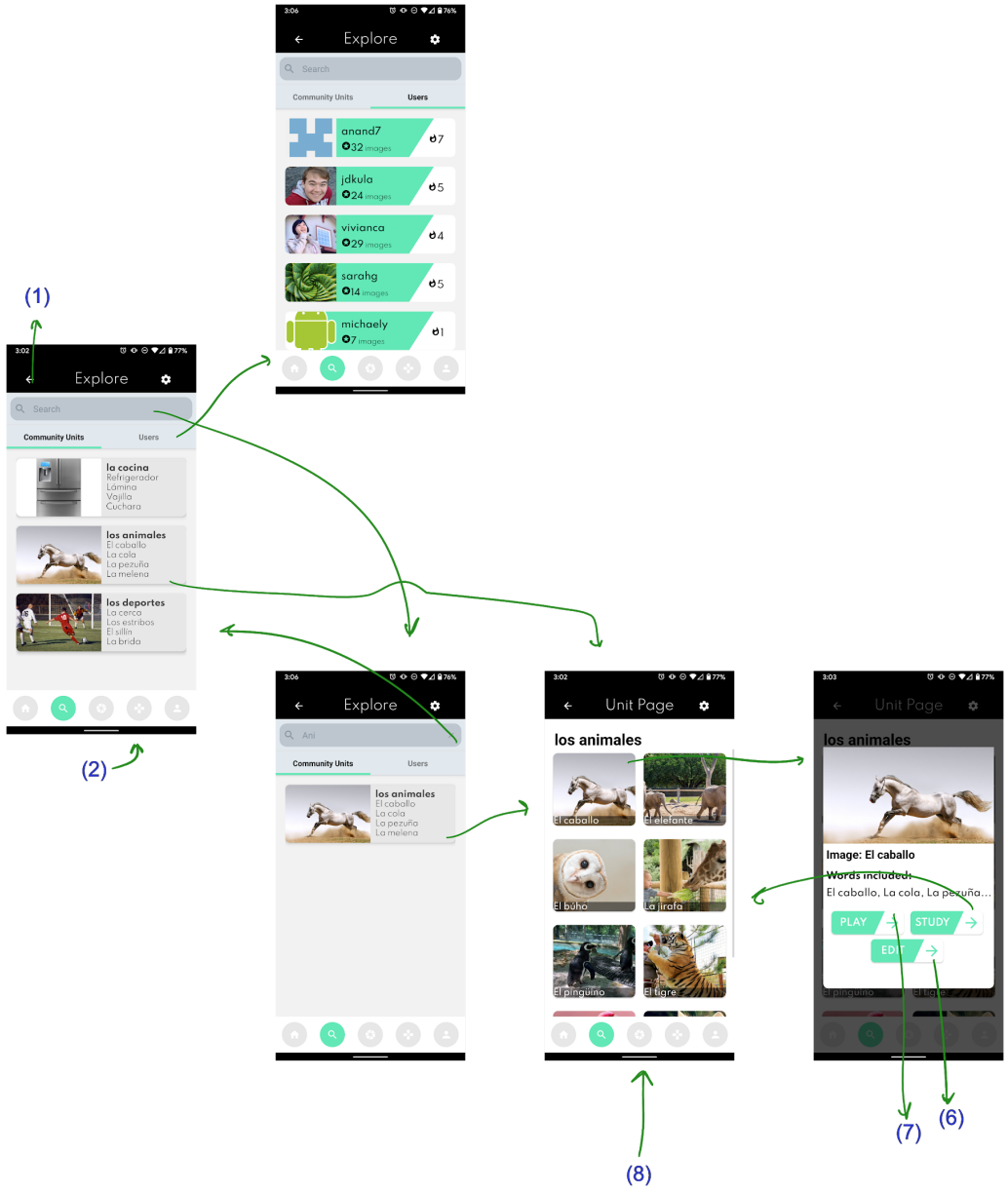


Med-Fi Prototype, Task 3

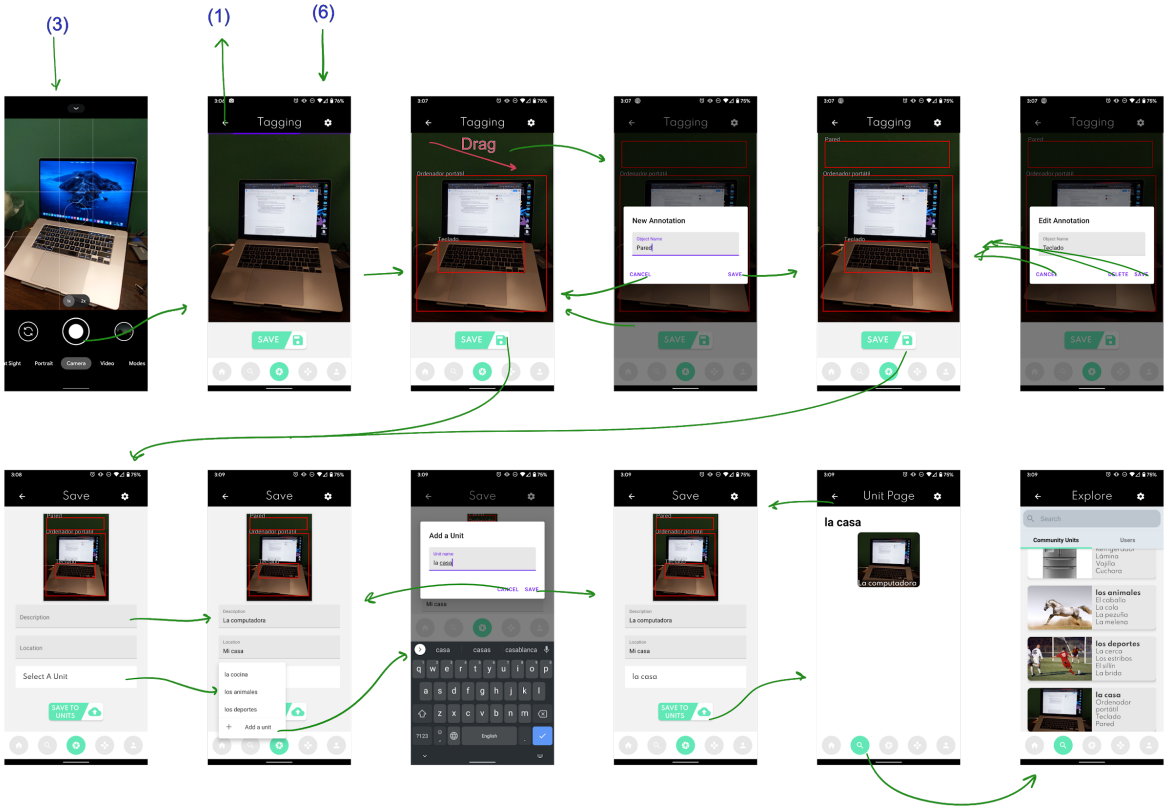
High-Fidelity Prototype & Interaction Storyboards



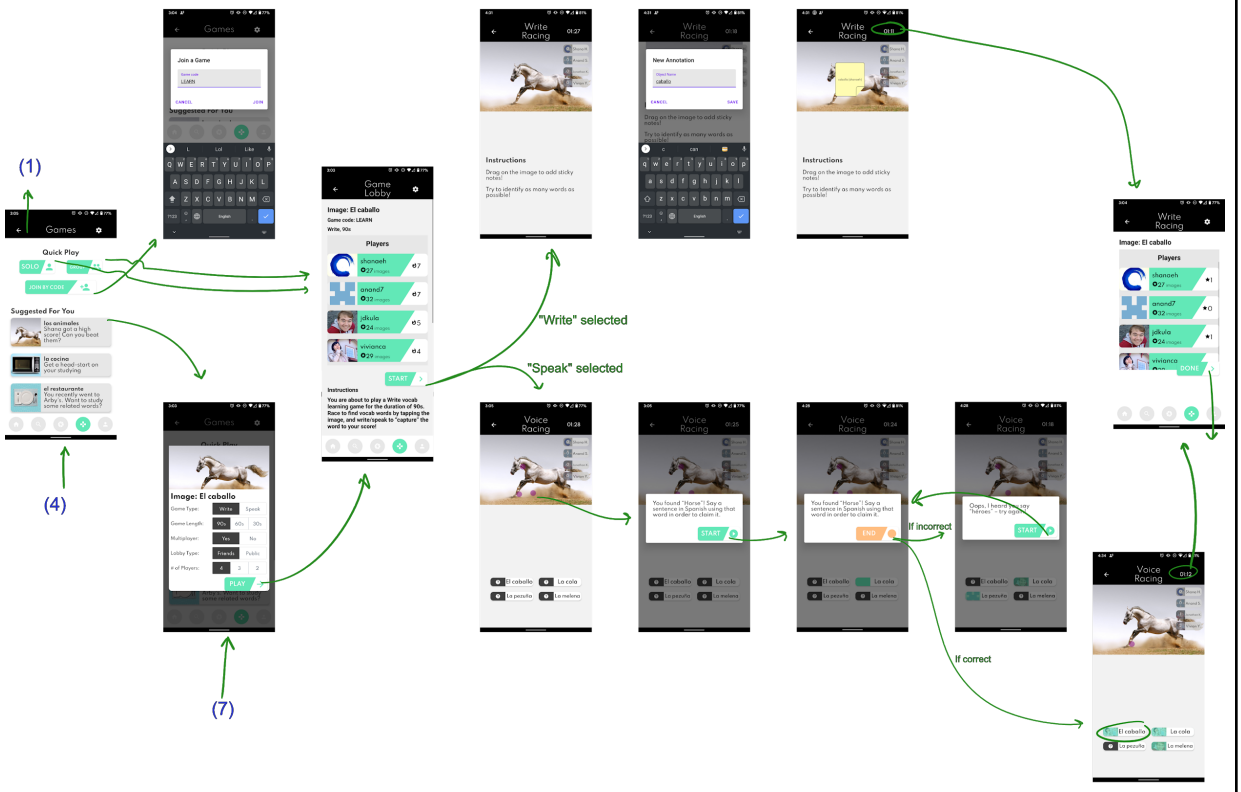
Hi-Fi Prototype: Screen Set 1, Onboarding, Home, and Settings



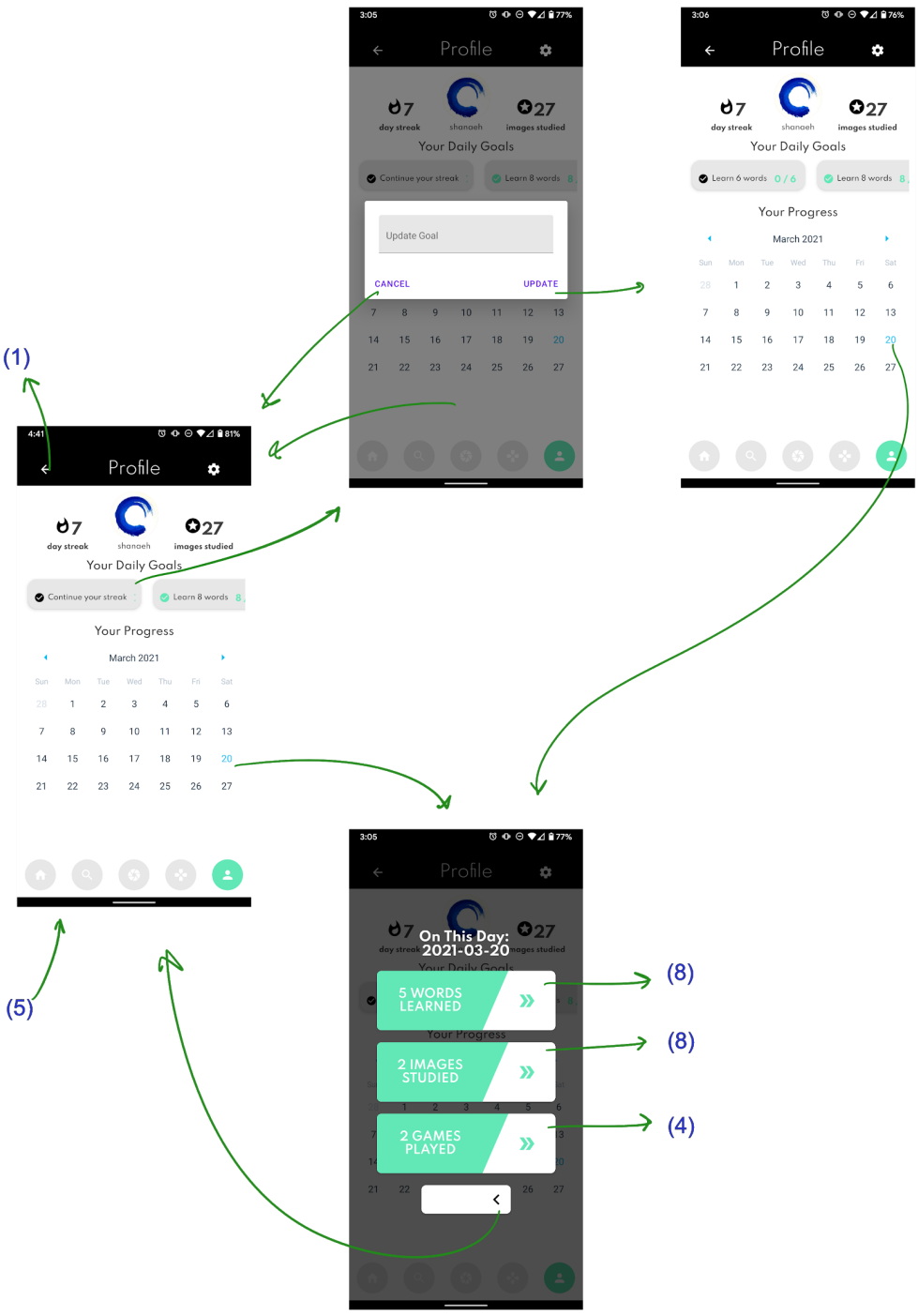
Hi-Fi Prototype: Screen Set 2, Explore



Hi-Fi Prototype: Screen Set 3, Image Capture and Tagging



Hi-Fi Prototype: Screen Set 4, Games



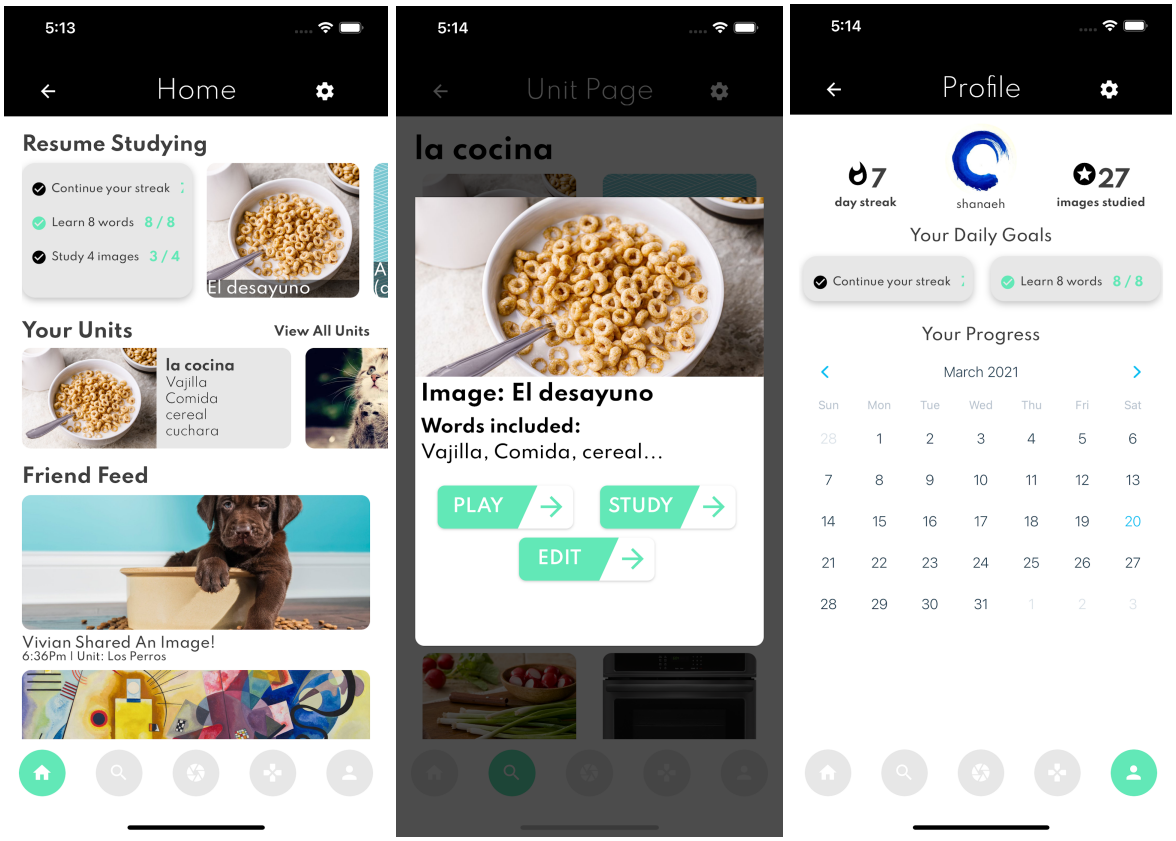
Hi-Fi Prototype: Screen Set 5, Profile

Major Usability Problems Addressed

For the Heuristic Evaluation, we had 0 Severity 4 violations and only 3 Severity 3 violations out of 38 Severity 1-4 violations.

Problem 1. Nested functionality (H7: flexibility + efficiency of use)

There was a lot of hidden information and features, such as users not knowing that you could click an image on the homepage to resume studying or to view your goals, and other users were uncertain how to reach the game hub or edit their images, or why your units were accessible only from the profile page.



Redesigned home page, image pop-up, and profile page for more clearly visible features.

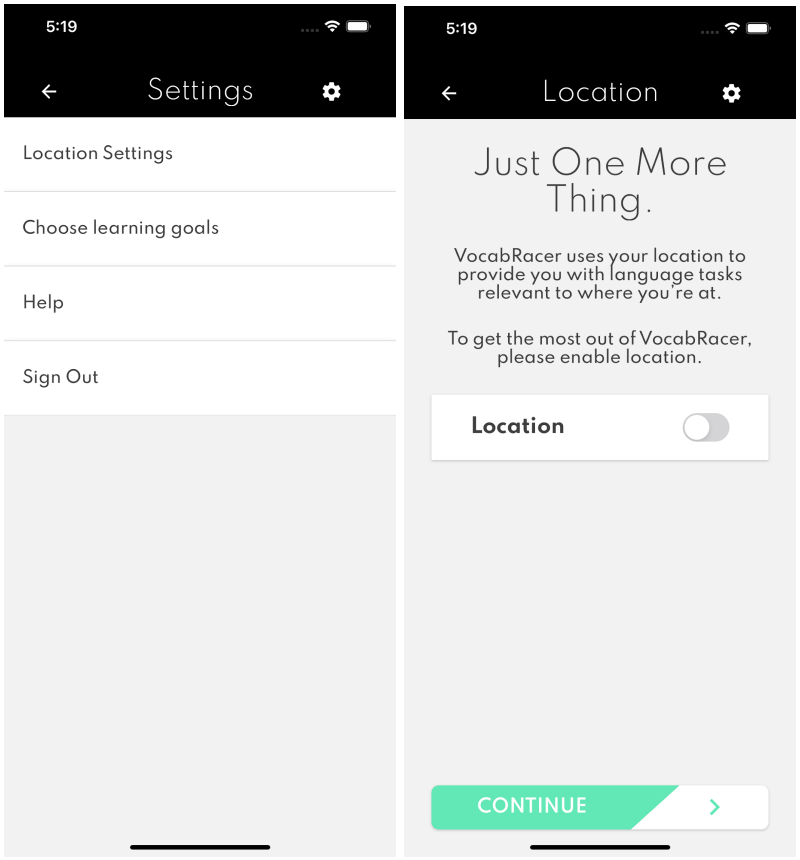
We addressed this problem, and also resolved several other violations, by significantly redesigning our app's interlinking elements.

1. The homepage features horizontal scrolling so you can see your most recent images, several of your units, and a button to go to another screen and view all your units organized by time.

2. From the unit pages, users can tap each image and have a menu directing them to edit, study, or play a game, which directly links them to core app functionality. In a future version of our app, we will more accurately link the “Play” and “Study” to
3. We also revamped the profile page to show your goals directly under the profile image and placed the calendar directly on the bottom of the screen so users can see their day-to-day progress without having to sift through multiple screens.

Problem 2. User documentation and sign-out (H3: user control and freedom, H:10 help and documentation)

The med-fi prototype did not have a visible icon for users to adjust their settings, nor were they able to sign-out of the app.



Settings icon is accessible throughout the app, which supports user control.

We addressed this problem by adding a settings icon with toggleable user permissions, links to further documentation, and user sign out.

Minor Usability Problems Addressed

22 of our 35 Severity 1-2 violations involved H3: user control and freedom (5), H4: consistency and standards (12), and H8: aesthetics and minimalist design (5).

Problem 3. Standardized components and minimalist aesthetic design

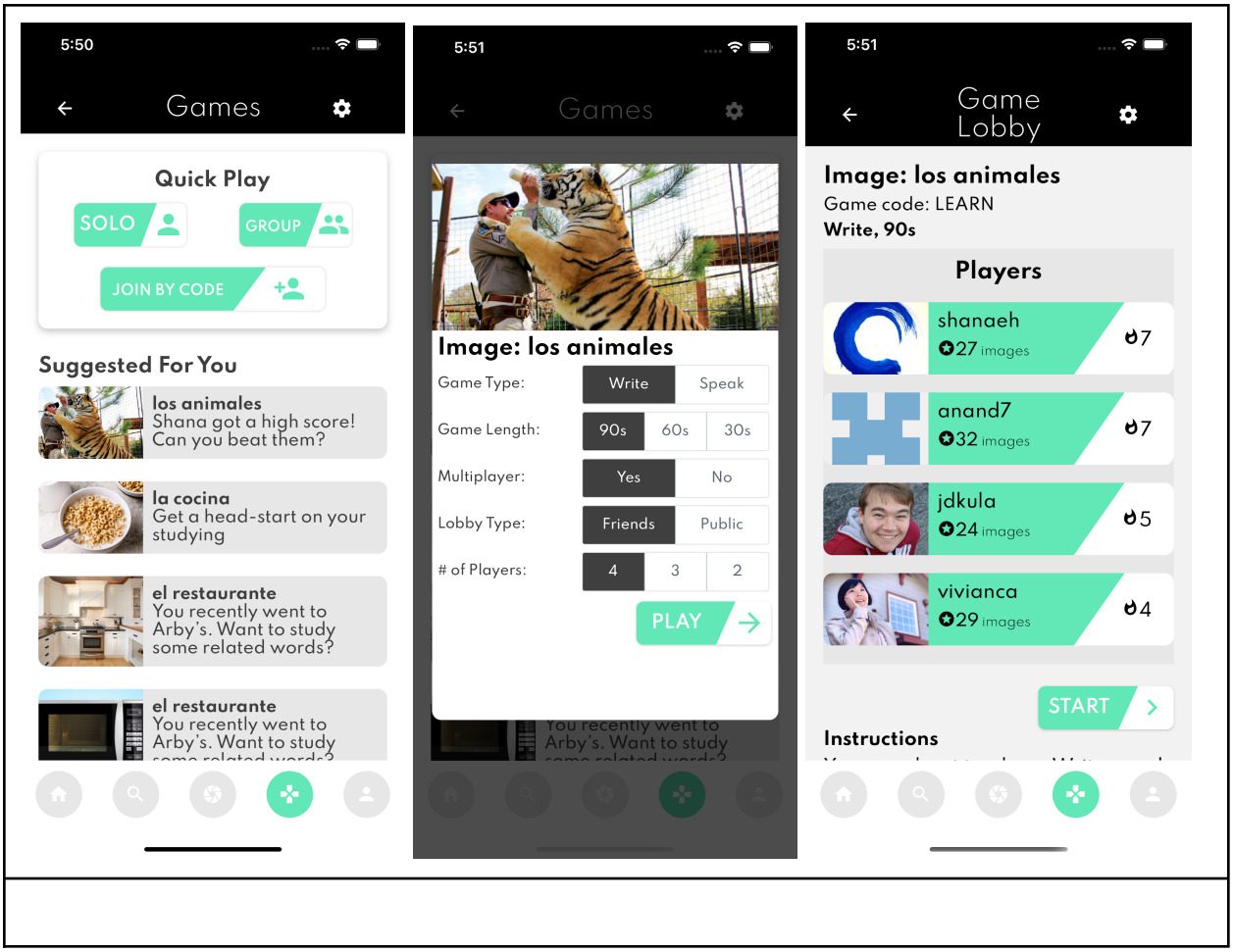
We collated and were able to solve the violations in the Hi-Fi prototype by creating reusable components and stylesheets for margins, buttons shapes, text sizes, and per-screen visual hierarchies, along with a consistently visible back-button.

A sampling of the consistent button, text, and image styling across the app.

Since React Native encourages reusable components, we could repurpose a component for the home page, unit page, and other screens, which helped us maintain standardized styling and aesthetic visual layouts.

Problem 4. User control and familiarity, error reduction

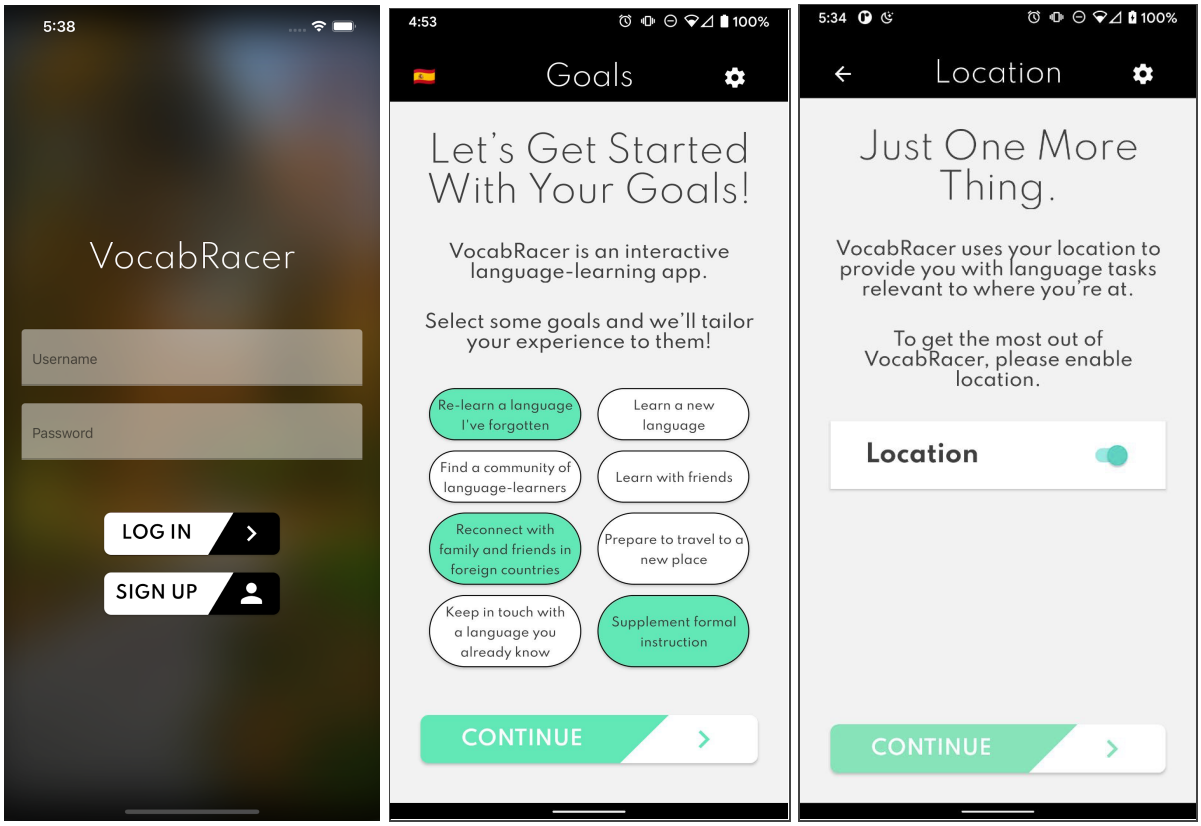
We also resolved another 11 violations, H1: visibility of status (3), H2: match system and world (2), H5: error prevention (1), H6: recognition not recall (2), H7: efficiency of use (2), and H9: help users with errors (1).



1. On each unit page and game lobby, we put the title and the selected mechanics
2. We adjusted our design from users pressing on an image card and being directed to another screen, to instead trigger a modal popup, so the user would instinctively know they were still in the same folder until they pressed the linking buttons.
3. On the game popup, we allowed users to change their settings until they pressed “Play” which brought them to the game lobby.
4. We added safeguards to the popup modals to allow the users to click away by tapping the modals’ backdrops.

Problem 5. User help and documentation

And lastly, we resolved the 2 H10: help and documentation violations by adding a new onboarding flow and a settings icon, as addressed in Problem 2.



The login user flow for a new user explains VocabRacer and asks permissions.

We added a new user onboarding that explained the core functionality of our app and what the user should expect before starting.

7. Final Prototype Implementation

We used React Native and Expo to create the mobile app. We used Google's Cloud Vision APIs for object recognition, object tagging, and translation. These features were actually implemented using Google's APIs; these were not Wizard of Oz features. Implementing the click-and-drag on an image took a significant amount of engineering work that was not made particularly easy by the tools we used (React Native). However, it was a significant piece of functionality that we are proud to have implemented.

The entire app's content is in Spanish, though we would love to support additional target languages in the future. We hard-coded the target language as Spanish to maximize accessibility to our testers in the USA, where Spanish is a popular language to learn, and to

maintain consistency in our prototype. We hard-coded language content (all words and images) as well because the intent is to demonstrate interactions between units, games, and tagged image creation. Also, the Friend Feed content is hard-coded to give an idea of what this feature could look like because we do not currently have an existing base of external users. For similar reasons, along with development complexity, the friends in games are robots as opposed to actual friends.

8. Summary and Next Steps

If we had more time, we would love to host our app on a server and add a true social component so users can share photos with one another and actually compete with each other. We would also like to flesh out the content for Spanish and add support for other languages. Lastly, we would also want to test the high-fidelity prototype on a variety of users so we can gain their insights and iterate further.

Reflecting on the entire quarter, it's interesting to compare what we thought we would build, with what we actually built. It is truly remarkable how much our users taught us during user testing throughout various stages of the design process, and how we adjusted our design to take into account their needs, such as a simple game task flow or an “Explore” feature, or asking for location permissions. They helped us determine which ideas were key features, and which ideas we needed to improve upon or eliminate. From this studio, it is clear that education is an area where technology can play a significant role.

We learned a great deal through this course and our project VocabRacer, and we would like to thank the CS 147 teaching staff for their time and valuable insights.