Mazalingo:

A Language Learning App for Children Three to Seven

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Abstract

The Mazalingo Early Language Learning app for Android seeks to teach younger children a secondary language at an early age. The process of building the application (app) is detailed in this report. The process includes determining the app to make and refining its focus, as well as reviewing with users to refine the design according to their needs.

Keywords: Language, Learning, Hindi, E-Learning, Picture Slides

Mazalingo: A Language Learning App for Kids

Introduction

In today's ever more globally connected world, many families seek to give their children an international worldview. One of the best ways to do this is to learn a second language at an early age. However, many parents are very busy, or may not have the financial ability or expertise needed to teach their children a second language. In order to assist these busy parents, we have created an app for Android called "Mazalingo". We sought to provide the parents with an effective means to easily introduce new languages at an early age, between three to seven years old. The app is built to be easily scalable by adding different language that follow the same format in one application, and can have multiple profiles so that multiple children can use the app and their progress can be saved.

We have developed a working prototype in Android Studio that focuses on learning basic vocabulary and alphabet. We have followed applicable Human Computer Interaction (HCI) design processes, and modified it to fit our time constraints and needs. We received input from children between the ages of three to seven regarding the application and its usability, and used the feedback to refine the application as needed. While none of our team consisted of educators, we researched effective learning methods of language with children. We tested this application with children in our target age group, and utilized it to provide a design that can be helpful in teaching children new languages.

Research and Framework

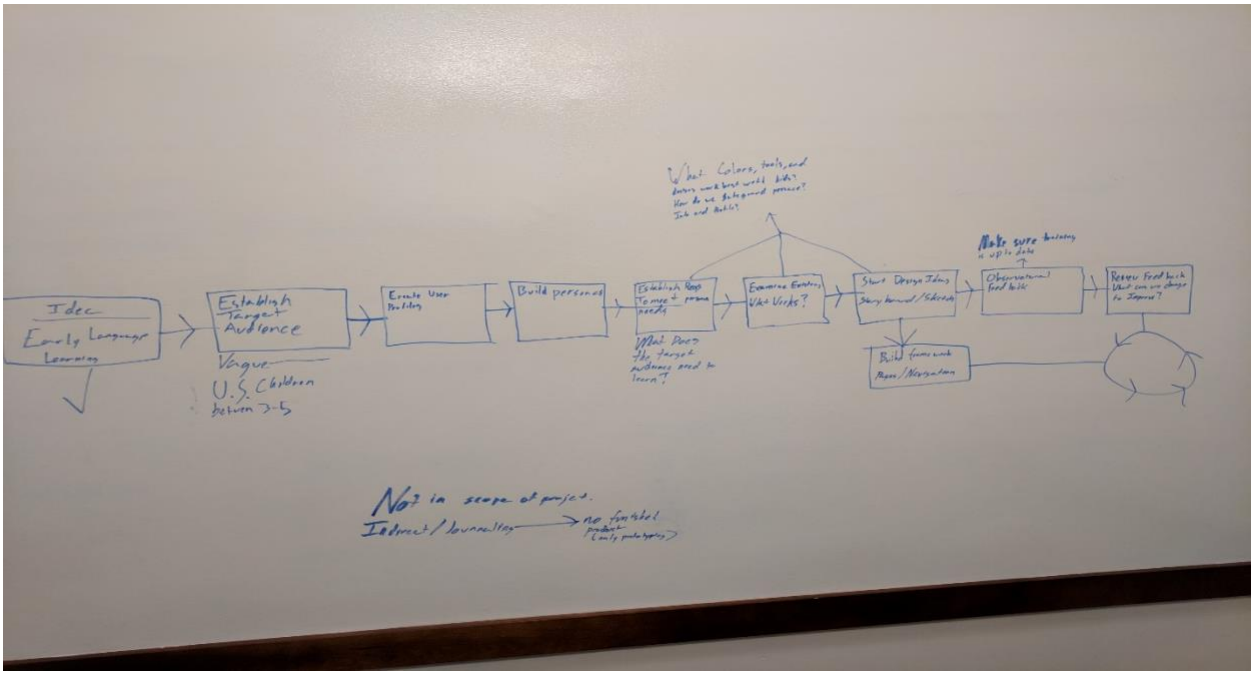
During the first few years of childhood, people younger than seven are rapidly building the primary language center in their brain. Recent research in language learning shows how

incredibly vital exposure to secondary languages is before the age of seven, as the brain is at its most receptive to learning and retaining new languages (Kuhl, 2010). Additionally, research has indicated how learning a secondary language can greatly improve a child's cognitive development, and general executive processes, such as time management (Bialystok, 2017).

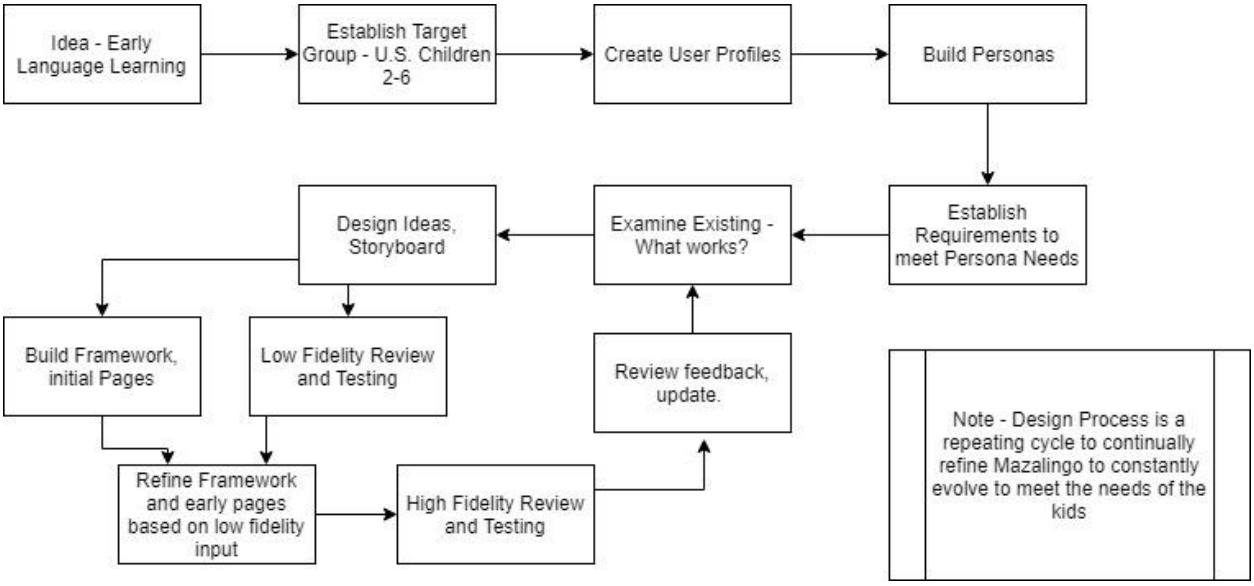
Because of these advantages we sought to develop an application to teach children a second language, or to supplement what they may already be learning at home. The Mazalingo name is based on the Hindi word Maza, meaning fun. The application is designed to teach kids Hindi in a fun, relaxing manner, and eventually scale out to other languages. The application will separate users via a profile system so that parents are able track their child's progress. An additional benefit is that multiple users can utilize the same device to learn.

Mazalingo Design Cycle

To best meet the requirements, set from the user profiles we decided to follow the following design cycle:



Further refined, our design cycle looked like this:



Scope

Initially, when we decided to create a learning language application we were not sure exactly which platform would work best to utilize. We had the option of developing a website, creating a computer program, or developing an app for use in the Android App store. We found that 75% of children under the age of eight use mobile devices, and continues to increase, while other media usage has decreased (Children's Media Use, 2013). This fact helped us to decide that an app would be the most useful method of creating the program. Additionally, two members of our group have experience building Android Applications, so we could easily capitalize on their expertise rather than utilizing an unfamiliar system.

After deciding on the platform that would best work for our application we researched competing applications on the market. We did this to find out what worked well with these applications, and how we could apply it to ours. Additionally, we wanted to find out what

languages and methods of learning were neglected. The applications reviewed included Duolingo, Dic Dic, Pacca Alpaca, and Gus on the Go.

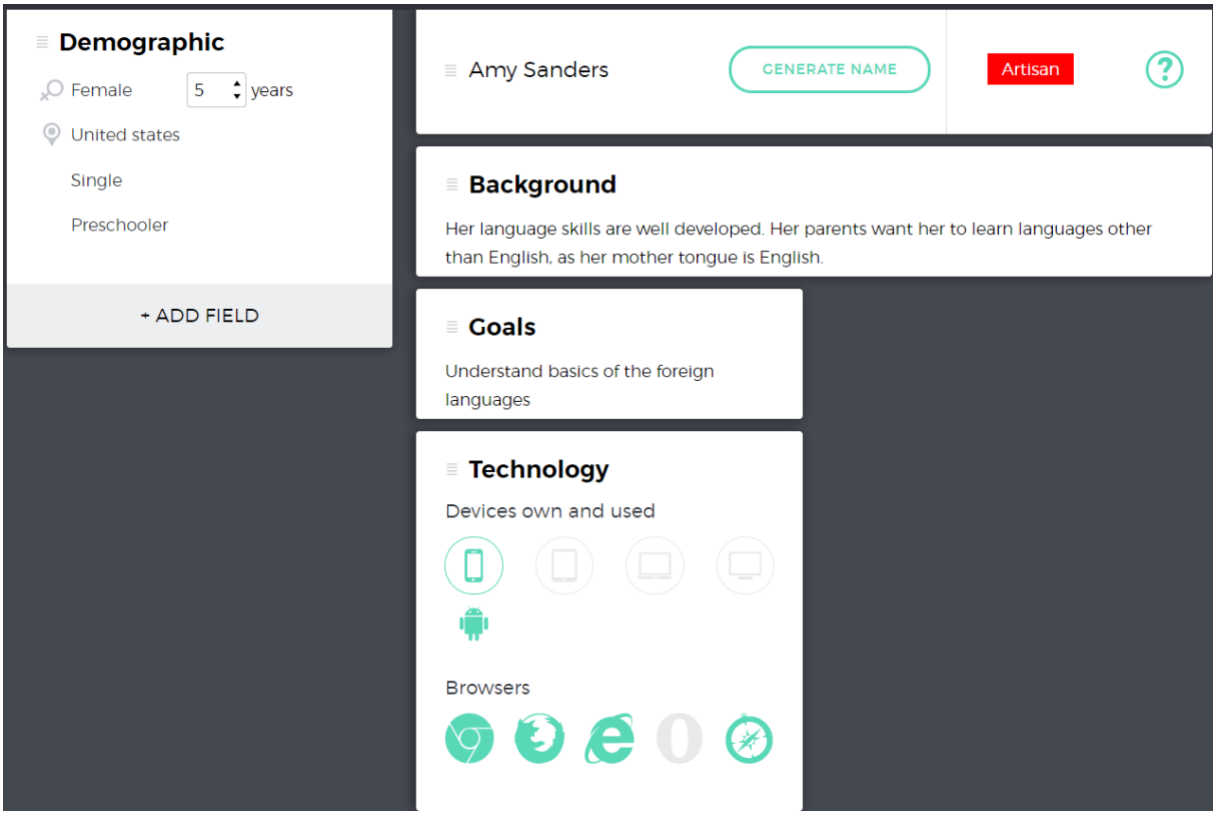
- Duolingo – Duolingo is a household name in language learning. On the mobile space you can learn up to 24 languages. The program starts with basic vocabulary, and works by slowly ramping up with simple vocabulary, and uses short lessons, usually five minutes or less. The lessons are usually five minutes or less, and are part of a rewarding progression path. However, it is designed around adult language learners, and is very heavy in using text and more complex navigation. This would be very difficult for early learners to use.
- Dic Dic – Dic Dic is a vocabulary learning application. It teaches kids simple words in Spanish, French, or Catalan. Each word has a picture, and a native speaker speaking the word. Children are expected to type out the phonetic spelling of the word to complete the exercise. While it is limited with younger children that may not be able to spell, older children will find it very useful, as it has multiple difficulty levels.
- Pacca Alpaca – This app is designed to introduce kids to different cultures and languages. With a series of minigames the children learn about 23 different countries and their languages. The downside is that it is more about language exposure rather than learning, so there is no specific language path. However, it does feature fantastic immersion with its exploratory games.
- Gus on the Go - A language learning app for kids that was created by pair of parents to encourage their kids to learn foreign languages. It uses multiple lessons and games. As kids progress through lessons they unlock more games. The creators used native speakers for the audio to create a more immersive environment. However, one of the drawbacks

was that some of the design was not as engaging as it could be, and some navigation parts were not clear.

After reviewing these language apps, we looked found that only Gus on the Go had a Hindi learning option. Additionally, we sought to make it easier for younger kids to get into the language learning by simplifying the application.

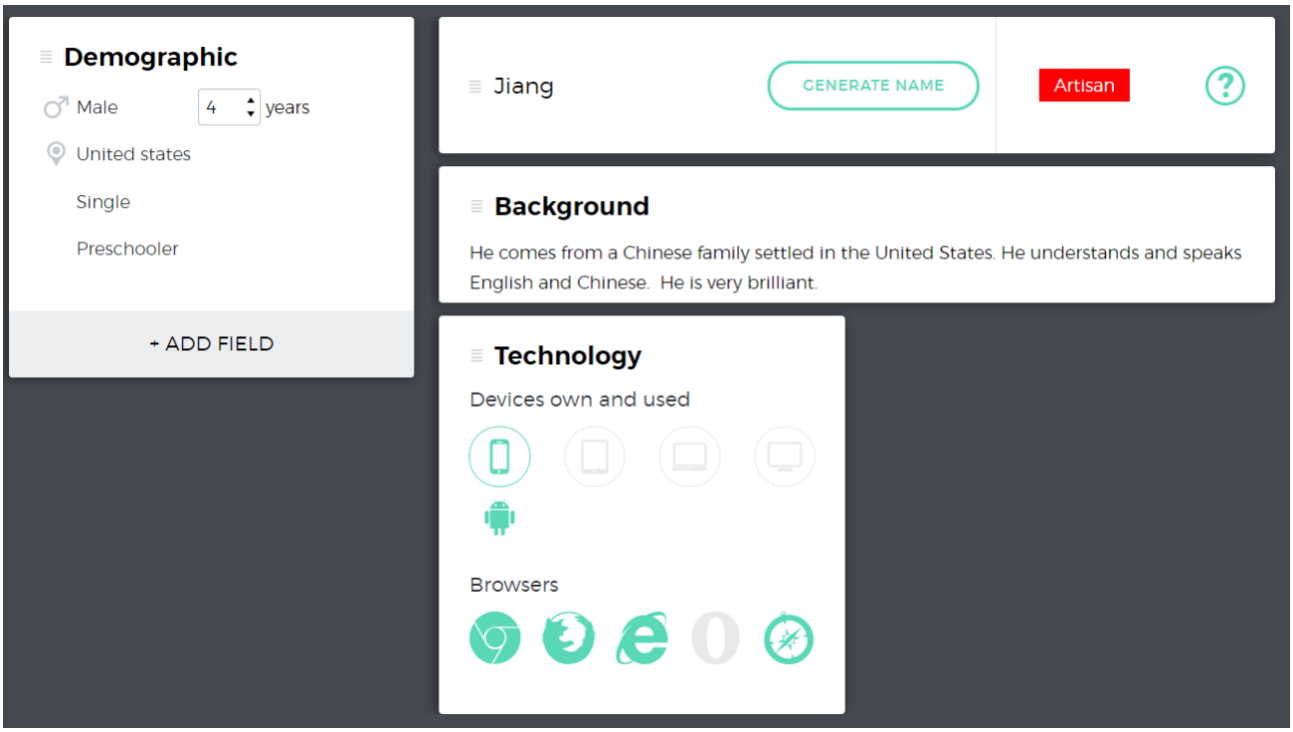
User Profiles and Personas

After reviewing the competing apps, we wanted to establish the user personas and requirements for the app. Our foundation for creating the personas was children between the ages of 3-7 whose parents would like them to start building a bilingual or trilingual foundation. Additionally, we were aiming for families that wanted to leverage technology for learning. We created several personas based on this, and used them as guidance while building the app.



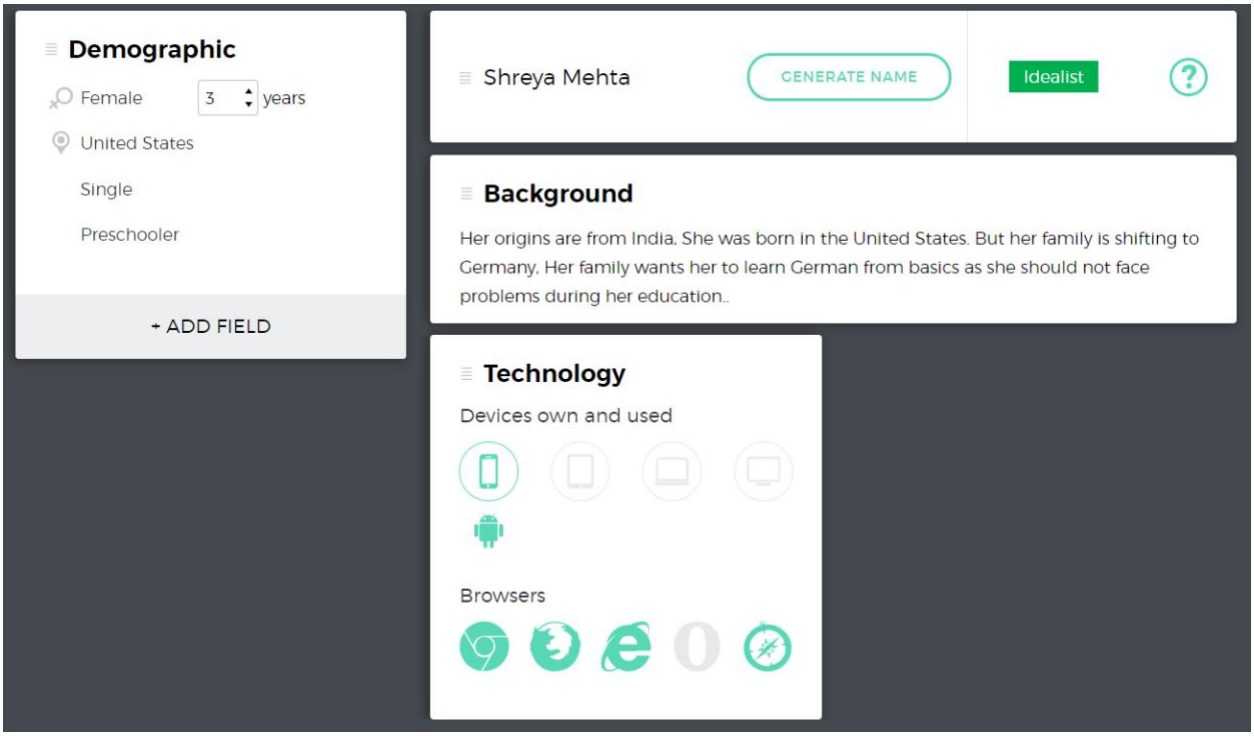
Persona:

Amy is a five-year-old child who will soon be attending a multicultural kindergarten. Her parents would like her to build skills in a foreign language to better prepare her for the kindergarten, but they do not have the means to pay for a tutor. Since they have a spare android tablet around the house they decided to see what options they have on the app store.



Persona:

Jiang Wu is a four-year-old preschooler in a Chinese family. While he already understands English and Mandarin Chinese, his parents would like for him to explore more languages. Due to their busy schedule, they are looking for something that will be portable so he can learn on the go.



Persona:

Shreya's family immigrated to the United States from India. Currently they are teaching her English and Hindi, but her father recently accepted a job in Germany. They are looking for an app that can reinforce what she is learning in English and Hindi, but will also teach her the basics in German for when she arrives there.

Establishing App Requirements

After building out our personas we wanted to research what learning methods would worked best to teach children new methods. We specifically were looking for what would work best in an app, as some methods would not work, (like using actual objects to establish words). What we found is that we would need to make sure we kept it simple. Our initial skeleton design featured a lot of text, and very busy backgrounds. As we further researched, we found we really needed to base it on a minimalist design to help the children using the application focus. At the

earliest language learning stages words need to be simple, common, and easy to visualize. Additionally, words that are introduced need to be simple everyday items, such as dogs, cats, apples, oranges, etc. When introducing sounds and alphabets letters and sounds need to be taught individually. From there, once the child has learned the meaning of the word the application can move on to more complex sentences and stories.

Goals of App and Constraints

Our primary purpose with the Mazalingo app was to get children into learning new languages easily at an early age. Our app seeks to make sure that children have an easy to use application that parents can utilize. Specifically, we are hoping for:

- Easy to use App
- Intuitive Learning
- Scalable learning applied to Multiple Languages
- Profile Based Segregation

With this system we are hoping to create an interactive tool parents can work with their children to learn new languages. We want the parents to load the profile and then hand it off to the child so they can easily and independently learn and navigate the system. We would like to have it be easy for the child to navigate to each portion, and understand what to do in each area. The app, in the future, should be scalable to multiple languages. And finally, knowing that children may share devices, we are hoping to use a profile based management system, so that each child can have their own profile.

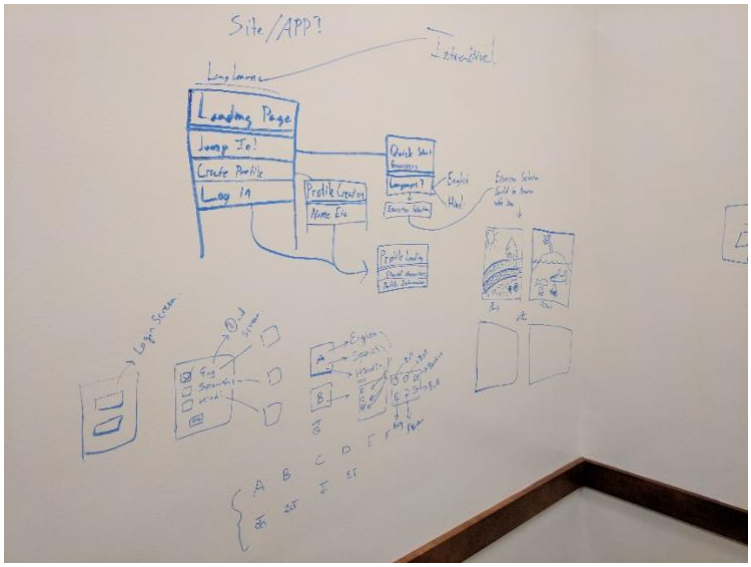
Design Process

We initially considered several navigational mapping designs for the app, and decided on which one would be the most intuitive. We initially created a user action and response chart, but then opted to use a hand drawn method to review how the navigation would work. This helped to better visualize and understand the app navigation.

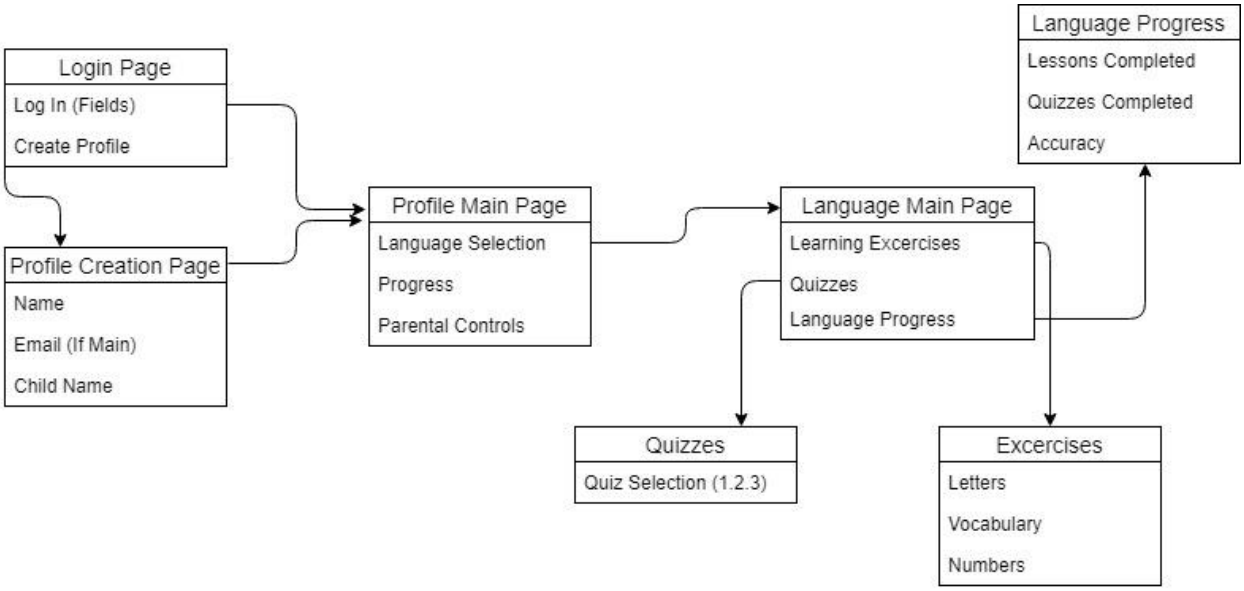
Initial User Action / System Response Chart:

User Opens App	App Loads Sign up/Login Page
User Selects Create Login	App loads login creation Page
User enters login information	App loads language selection screen
User selects language	App displays selected language exercises
User selects basics	App displays basics menu
User selects alphabet	App loads and shows alphabet
User selects vocabulary	App loads vocabulary exercises
User clicks back arrow	App moves back one page
(In Vocab) User taps image	App plays word for image
(In Vocab) User taps next arrow	App moves to next vocab word
(In Quiz) User taps word/sound icon	App plays audio for quiz word
(In Quiz) User taps image	App verifies it matches word, marks correct/incorrect.
User taps next button	App moves forward one page
User fills out profile fields	App stores profile information
User taps home button on phone	App closes

After doing the user action list we switched to drawing it out to better understand, and to visually come up with different design ideas. After hand drawing on the wall we opted to utilize draw.io to further refine the design to a more formal layout.



Hand Drawn Layout Ideas



Further Refined Navigation

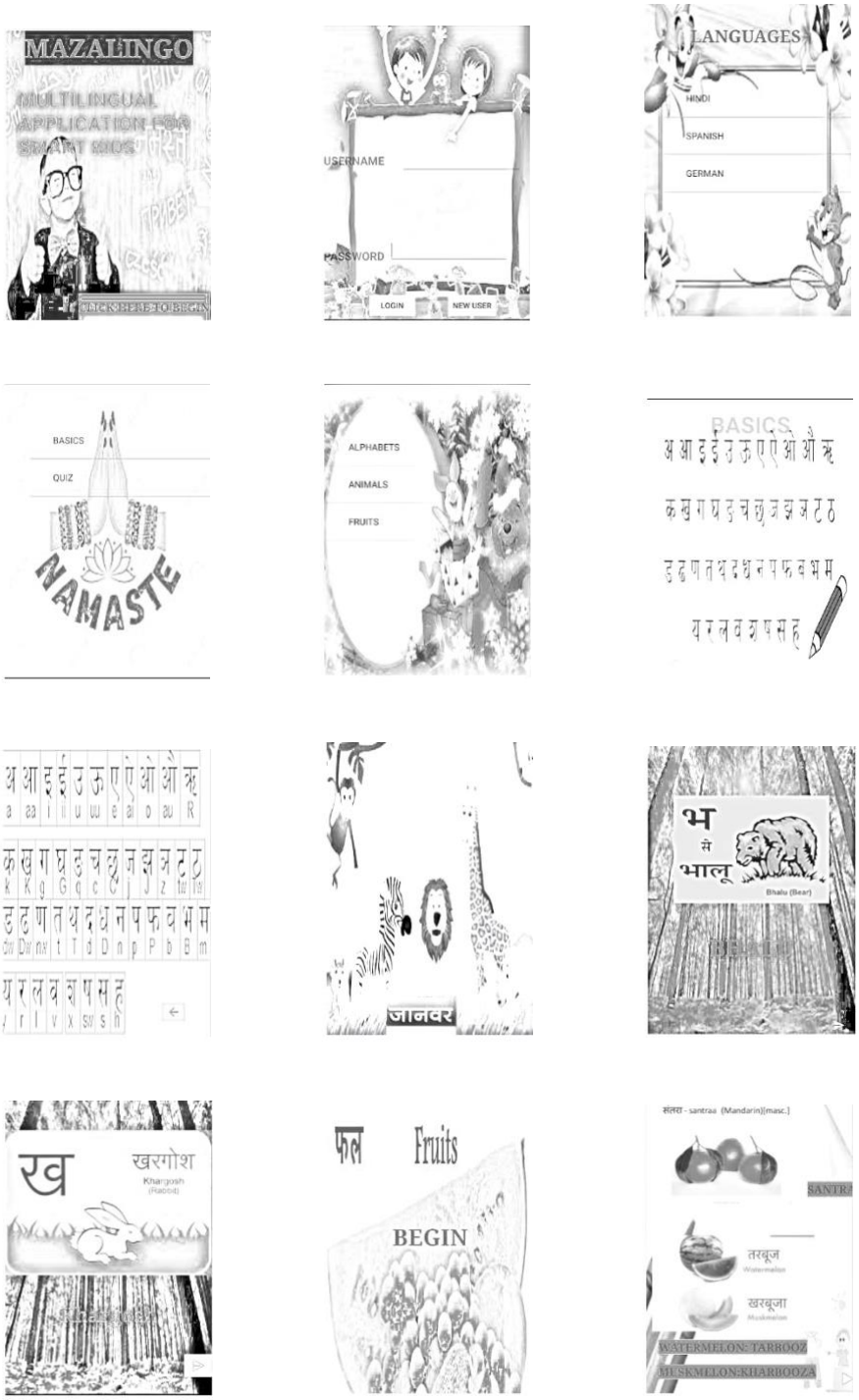
After we designed the navigation and initial design we moved to creating an initial design in Android Studio. As mentioned previously, we had some idea of what we wanted to implement, but we further flushed it out here. During this physical design phase, we created our initial android prototype app with icons, audio, and navigation. We further used this app in our prototyping and testing phases.

Prototyping and User Feedback

We used both low fidelity and high fidelity prototyping. Due to time constraints we were limited to getting feedback via storyboarding in the low fidelity prototyping.

Low Fidelity Prototyping

For our low fidelity prototyping we focused on using a modified storyboarding method. Basically, we ran out design though a photoshop layout editor that adjusted the margins and design to allow for notes to be written on the paper for feedback. Additionally, once we printed these out we combined them with playing the corresponding sounds from a cell phone.



We shared the initial storyboards with two users (children under the age of seven) to receive their feedback. Specifically, we looked for:

- What areas did they have trouble understanding what to do?

- What areas were they most attracted to?
- What areas they said would improve the usability.
- Noted any other information that would be relevant.

When we conducted the test, we used crayons to help the children in navigating the paper, and seeing where they would like to tap the paper. All interviews were conducted with a parent present and assisting the child if they were unsure of how to proceed. We did this to try to match how the app would be used outside of testing. We use randomized naming schema by assigning a letter and number to a child for notation to anonymize the data as much as possible.

What we noticed from the low fidelity prototyping was that we were much too reliant on text, and that some of the menus were not intuitive (for instance, the launch page had a 'click here to launch app' button. None of the participants colored on the button, instead opting to scrawl on the face of the kid in the picture). Furthermore, we needed to refine the login page. The parents involved (and kids!) thought that it would be easier to have one parent login, then separate profiles after that that children could use to switch between. For the letters we noticed that participants loved tracing and drawing around the letters. Participants did enjoy the overall look and feel of the sketches used for the app.

High Fidelity Prototyping

Unfortunately, due to time limitations we did not get to implement all the changes we wanted to make in the application. However, we made some adjustments to the navigation, quiz, and vocabulary sections. We adjusted the quiz to be simpler by playing a sound and showing text, then below listing two picture options to choose from. Additionally, we implemented forward and back arrows, and standardized the backgrounds. The process of building the app was very

time consuming, but produced good, and very usable results. Below we have attached several screen shots of the app:

Launch Screen

1

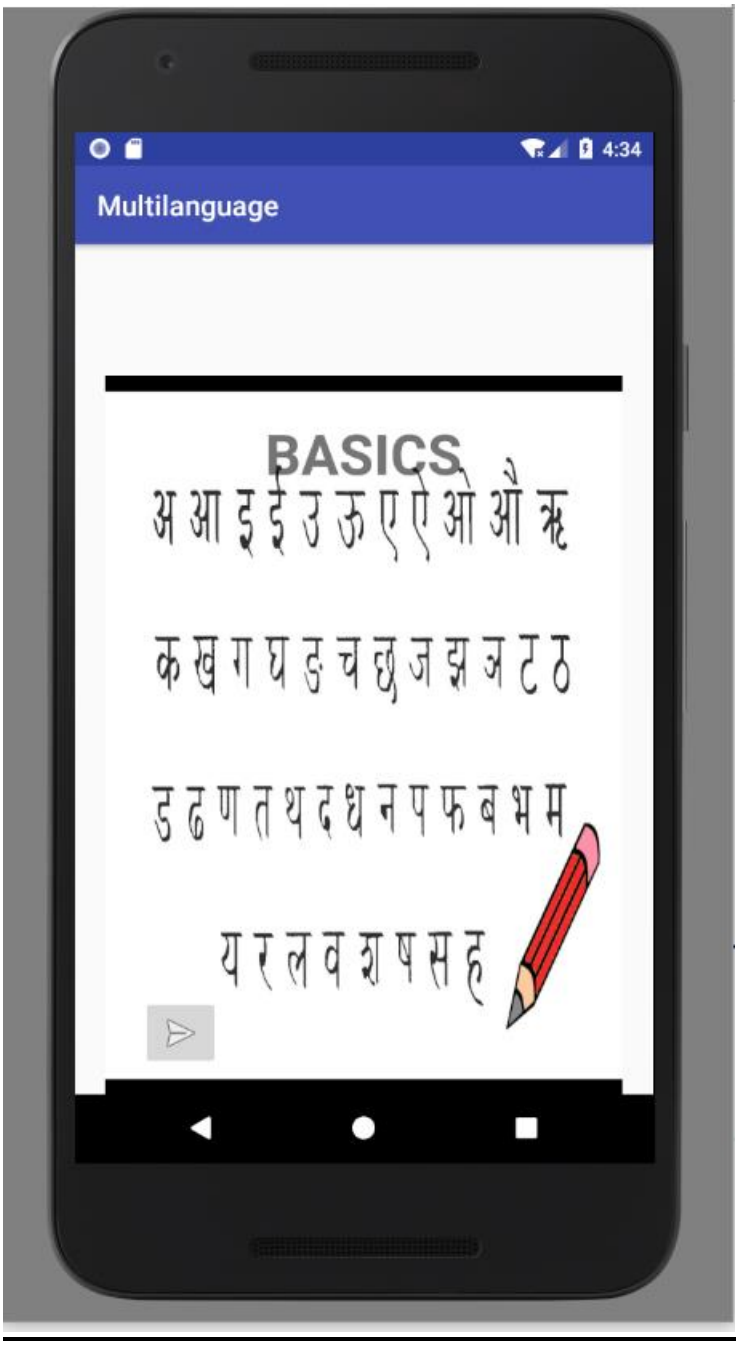
Profile Login Page

Language Selection

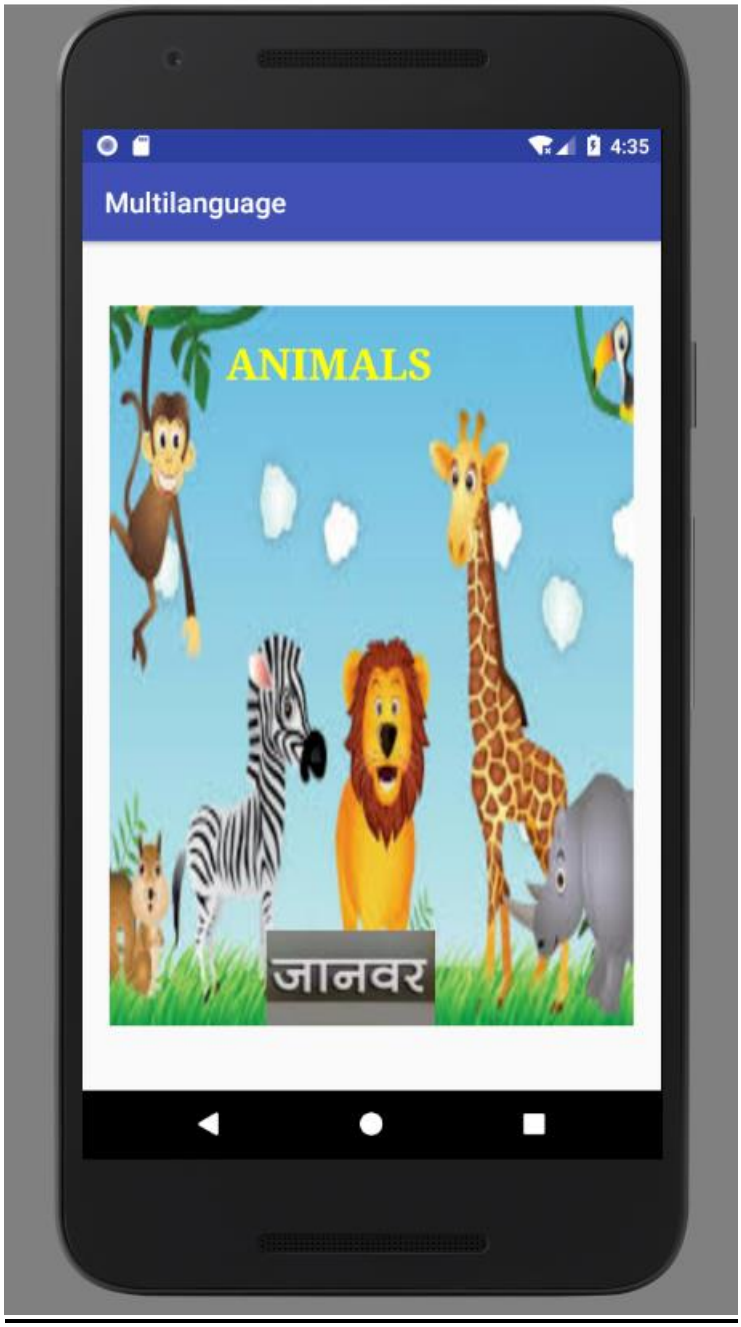
Hindi Start Page

Hindi Basics Launch Page

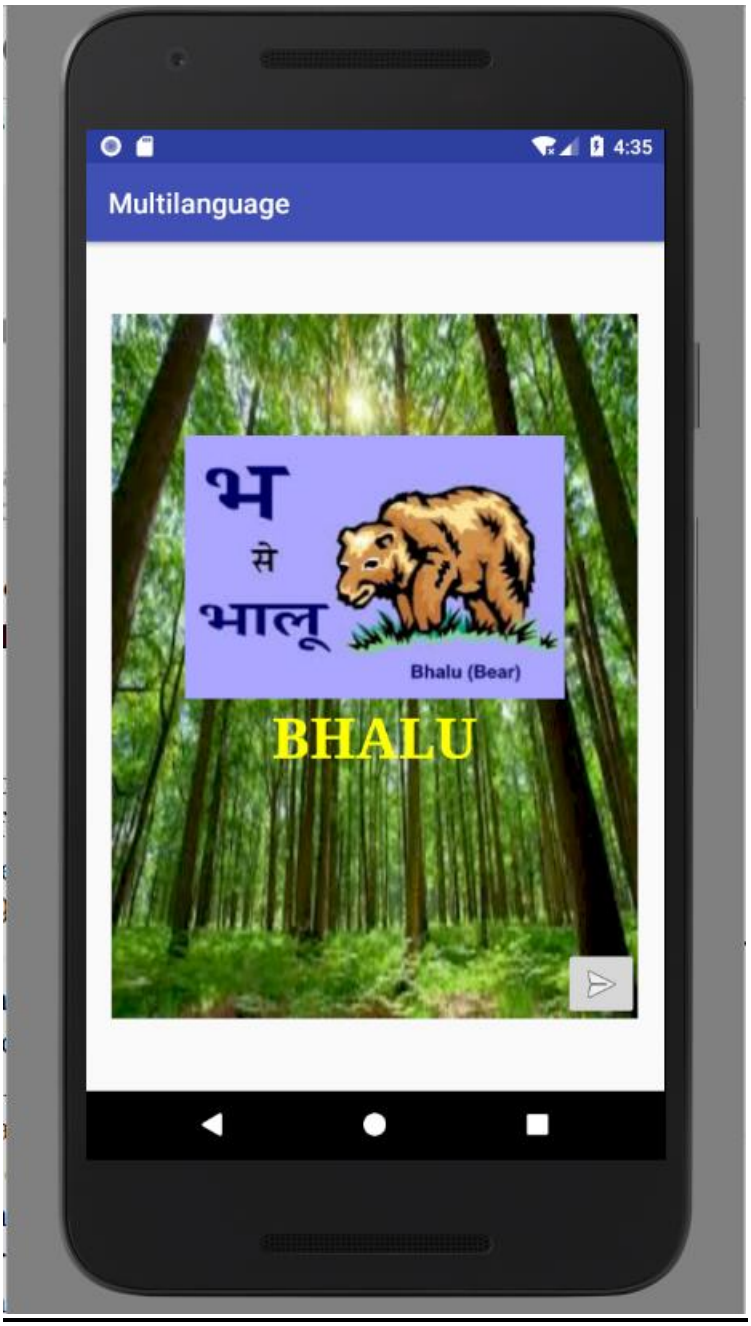
Hindi aa letter



Hindi Alphabet



Hindi Animals Launch Page



Bhalu (Bear)

Quiz Page (gray button plays audio)

Evaluation

Due to availability limitations we used the same children as before. Because they had experienced the low fidelity prototype we believe there may be some skill with the application that is already learn, and may not fully reflect how a child who is completely new to the application may interact with it. Again, we had parents present for testing. We utilized loading the app on to a Google Pixel phone from Android Studio to test with, then handed it off to the child with the initial app page loaded. We recorded how easily they could navigate the app, when they asked for parental help, what issues they ran into, how easily they learned how to navigate the app, and how they felt about using it. The process was in the form of observation, with occasional informal questions. Specifically, we asked about their enjoyment of the app, and what parts they liked best. We also asked them what they would change.

What we observed was that they still had some trouble with the initial page and trying to tap on the face of the kid in the picture, even with a changed up go button. For the Profile page, they took a second, and then handed it to their parent. Beyond the initial profile page, they were much more confident in navigating the app. We had them focus on the more refined Hindi section. They enjoyed tapping on the letters and mimicking the application. In the vocabulary the control of the audio feedback helped them the carry that knowledge into the quiz section. We had two versions of the quiz in the app, and found that the quiz that used an audio/letters play button was much more understandable for the kids. Initially the back and forward arrows were a little tricky for one of the kids, but after they understood where they were they quickly learned how to navigate them. Overall, the children found the app enjoyable, and wanted to keep playing it beyond the interview.

Conclusion

This project provided a lot of insight to our team about best practices learning methods, especially in language learning for kids. It taught us a lot about considerations to take when working interactive designs, and how to best build out navigable applications. While we primarily focused on existing research to build our design, it was fantastic to work with kids to better understand how they see designs. It added a level of youthful creativity that we may not have been able to see otherwise, and really stresses the importance of involving participants. Additionally, working with a group taught us a lot about setting expectations, and limitations with time. With a lot of moving parts, it was tricky to make sure everyone was consistently involved in the design process. In addition, our search for participants was later that we could have started it, so it limited the sample size we were able to get, and changes we could implement between prototypes. In the future, we would have this process done sooner, and would allocate more time to evaluate and implement changes recommended by participants. In working with building an actual application as the prototype we were limited in the changes we could make with the time allotted. In the future, we hope to further build the application to add additional pages, exercises, and languages and would test with an actual prototyping app, like marvel, before building into the app itself. Overall, we learned a tremendous amount about the HCI Process, Children's Language Learning, and overall design improvement ideas.

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Appendix:
Permission Form created for Parents:

Parental Permission for Participation of a Child in a Research Study
University of Cincinnati

Mazalingo: A Language Learning App

Description of the research and your child's participation

You are invited to participate in a research study conducted by Brandon Lindsay. The purpose of this research is to determine the usefulness of the Mazalingo Application in teaching Hindi as a second language to children whose primary language is English.

Your child's participation will involve reviewing and giving feedback on:

- Sketches of the Mazalingo Application (a paper walkthrough)
- The Prototype Mazalingo Application

The amount of time required for your child's participation will be 1 hour for 2 sessions (30 minutes per session).

Risks and discomforts

There are no known risks associated with this research.

Potential benefits

The child may develop a small aptitude for Hindi. This research may help us to understand the ability of children to learn a second language using the Mazalingo App.

Protection of confidentiality

We will do everything we can to protect your child's privacy. Any identifiable information for you and/or your child will be encoded, and only the primary researchers will have access to any identifiable information. Your child's identity will not be revealed in any publication resulting from this study.

No pictures of identifiable video of your child will be taken during this study

Voluntary participation

Participation in this research study is voluntary. You may refuse to allow your child to participate or withdraw your child from the study at any time. Your child will not be penalized in any way should you decide not to allow your child to participate or to withdraw your child from this study.

Contact information

If you have any questions or concerns about this study or if any problems arise, please contact Brandon Lindsay at University of Cincinnati at 513.999.9999, ext. xxxx. If you have any questions or concerns about your child's rights as a research participant, please contact the University Institutional Review Board at 513.999.999, ext. xxxx.

Consent

I have read this parental permission form and have been given the opportunity to ask questions. I give my permission for my child to participate in this study.

Participant's signature_____ Date:_____

Child's Name:_____

A copy of this parental permission form should be given to you.

Credit Section

For this assignment we would like to assign credit equally amongst all members