Alt Text: LangVRse logo next to Langu, the app's world mascot wearing a VR headset

LangVRse

High-Fidelity & Final Report

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CS 147: Human-Computer Interaction, Winter 2021
The Virtual Learnscape: AR/VR x Education

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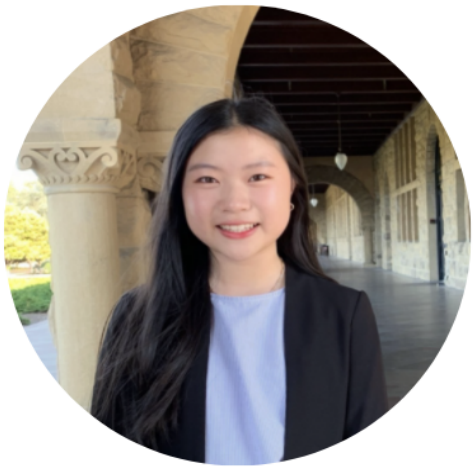

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Mission Statement / Value Proposition

The mission of *LangVRse* is to create an encouraging and immersive language-learning environment for all. By focusing on a combination of culture, listening, reading, and writing, we hope to create a VR experience that allows users to be immersed in a different country and wholeheartedly learn that language. **Immerse yourself in a new language and culture!**

Problem and Solution Overview

Current language learning platforms tend to focus on the bare basics of language aquisition, often using rote memorization to solely teach basic vocabulary. Despite dedication to learning a language, these forms of learning fail users by not allowing them to dive deeper into how a language is used in day-to-day life, people want to be able to say more than just hello! Through complete immersion in VR, we hope to capture the elements of a language that can get lost through the current approach. We want people to learn everything about their language, including slang terms, cultural terms and practices, the beauty of the actual places that speak your languages, and so much more.

Needfinding Interviews

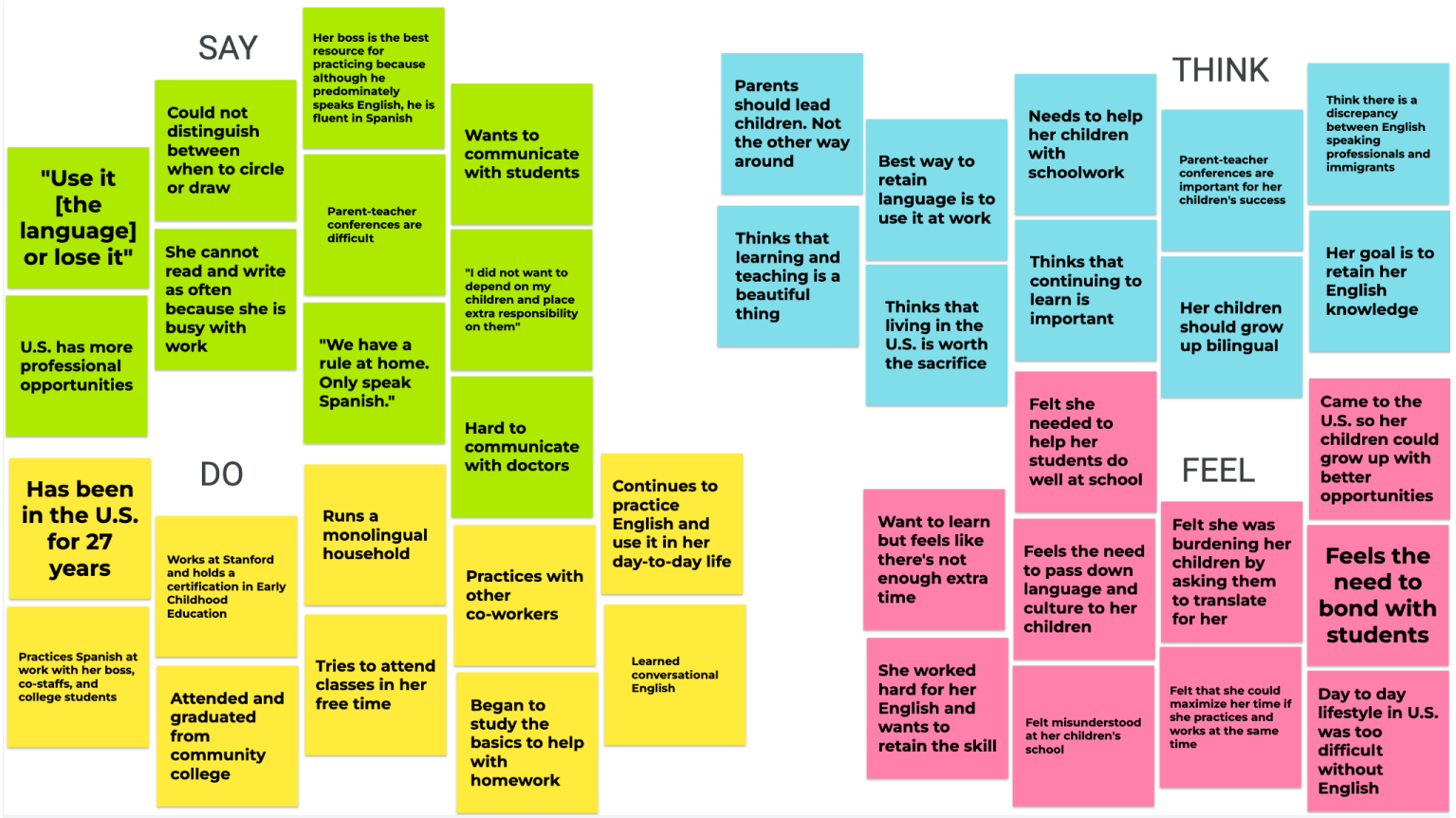
When thinking about language learning, we interviewed people of all linguistic backgrounds to better understand their needs, from skilled and experienced language teachers to monolingual individuals.

Here are some quick statistics / numbers about the people we interviewed:

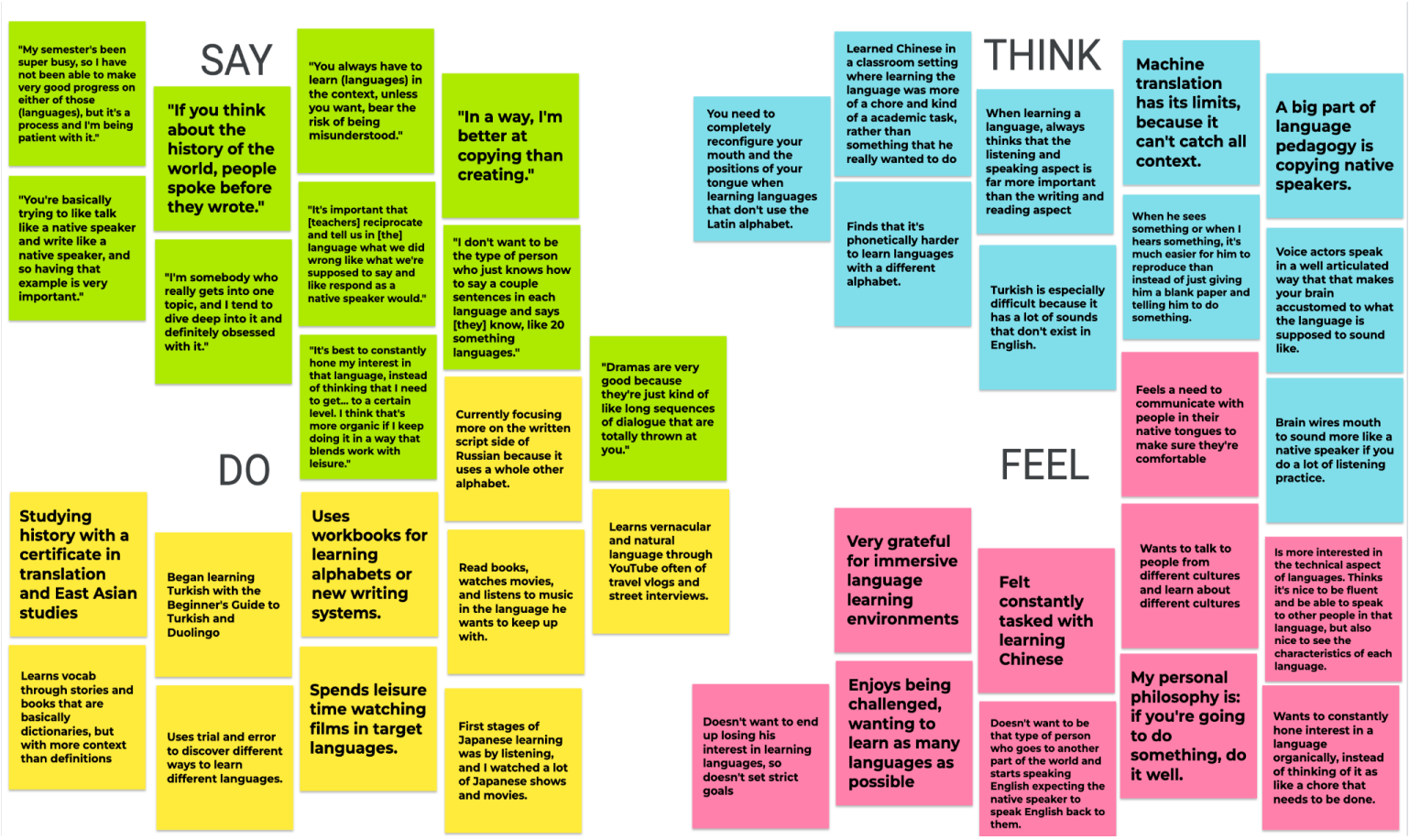
- 2 rounds of interviews
- 8 people
- 20s - 60s for age range
- 5 countries of origin
    - U.S.A., Mexico, El Salvador, China, South Korea
- 10 different languages spoken
    - English, Spanish, Chinese, Japanese, Korean, Russian, Turkish, French, German, South Tiguan

The information we learned from these languages was invaluable, as we were able to truly understand what pushes people to learn and why they had or hadn't developed complete fluency in the non-native languages they had learned. Through empathy maps (below) and reviewing quotes and specifics from our interviews, we learned that people need true immersion, they need to be able to understand how the language is used in everyday life. They also need the encouragement to lean into their survival skills, meaning that they should feel as if the new language is their only form of communication, pushing them to communicate and develop that language past their comfort zone. An approach that combined these needs would be able to take them to the next level, surpassing what they have been able to learn and achieve with current learning techniques.

Empathy Map from Claudia's Interview



Empathy Map from Robin's Interview



POV & Experience Prototypes

Point of View (POV) Statements

From the interviews that we conducted in our needfinding interviews, we created four different POV statements, one for each of the interviewees in our second round of interviews.

Adria Hernandez

We met Adria Hernandez, a high school Spanish teacher who has taught at a

predominantly Latinx/bilingual school for 24 years.
We were surprised to notice that she was openly communicating that the school's administration's approach to language learning did not align with what her professional opinion was.
We wonder if this means that she prioritizes the "survival instinct" or immersion form of language learning rather than the standards-based form of achievement-measuring.
It would be game changing for Ms. Hernandez to have access to learning environments/tools that can provide a form of immersion while still being in the classroom.

John Gullickson

We met John Gullickson, a retired veteran stationed in Germany during his time in the army and current high school Math teacher who has taught at a predominantly Latinx/bilingual school for 24 years.
We were surprised to notice that despite not completely-understanding Spanish and struggling with learning it himself, he allows students to speak Spanish freely in the classroom.
We wonder if this means his teaching style is influenced by his initial experiences with learning German while in Germany.
It would be game changing to create a similar friendly experience for Mr. Gullickson while he continues to learn Spanish.

Christopher Gomez

We met Christopher (Chris) Gomez, a college student at New Mexico State University (NMSU) and a member of the Ysleta Del Sur Pueblo tribe in El Paso, TX.
We were surprised to notice that the revitalization of the South Tiguan language was not a main priority of the tribe.
We wonder if this means that larger issues such as getting their land back from El Paso County and the Ysleta Del Sur Pueblo v. Texas court case are detracting from the cultural and social aspects of the group.
It would be game changing to mediate the larger needs of the community and the maintenance of their language and cultural roots.

May Miao

We met May Miao, a Chinese-born university professor who has taught Japanese for five years, motivated to begin studying Japanese herself by historical events between China and Japan.
We were surprised to notice that despite thinking that learning Korean was "too

easy" and very similar to Chinese and Japanese, she has not stayed motivated to continue studying it beyond her PhD.
We wonder if this means that learners should study language and culture/history concurrently to stay interested.
It would be game changing to provide May with a way to continue studying Korean in tandem with better understanding Korea's culture and history.

How Might We? (HMW) Statements

For each POV perspective we developed, we developed 10+ "How Might We?" HWM statements. These are some of the best ones for each individual.

Adria Hernandez

- How might we recreate immersive learning experiences?
- How might we foster survival instincts in language learning?
- How might we help develop further and deeper understanding of the material that people are reading/watching as they learn?
- How might we encourage students to become fully immersed in a language if they do not have the means to study abroad or access to language conversation partners outside of school?

John Gullickson

- How might we create a comfortable and non-judgemental environment for language practice?
- How might we motivate people to study languages they may not "need to"?
- How might we help those who already know parts of the language get past that initial learning curve?
- How might we create ways for language learners to better identify differences between regional dialects of a language?

Christopher Gomez

- How can we honor the oral practices/traditions of the culture while also aiming to provide resources of other forms (written, pictures, etc.)?
- How might we tie the languages that are currently understood (English and Spanish) to the revival of their native language (South Tiguan)?
- How might we maintain the important cultural factors associated with different languages?

- How might we create opportunities for language learning without readily accessible immersive environments / native speakers?

May Miao

- How might we take advantage of the languages that someone already knows to help them learn more?
- How can we integrate historical knowledge into language lessons and learning?
- How can we popularize new types of practice methods for language learning (ex. Journaling everyday in the language you're learning)?
- How can we make language learning approachable but not too easy/simplified?

Top 3 Solutions

Based on the statements above, we generated three different ideas that could allow us to fulfill as many needs as possible.

Solution #1

A VR **choose your own adventure storyline** that places you in different scenarios you might encounter when you are abroad in a new country.

Solution #2

A VR/AR **singing app** where learners can sing along prepared-AR music videos in **different dialects** of a language with subtitled lyrics/phonetic pronunciations.

Solution #3

A AR/VR cooking application where you **prepare recipes and dishes from other countries while fully immersed** in another language.

Our Experience Prototypes

Based on the solutions, we designed three different experience prototypes. We designed these prototypes on Google Slides and had four different users test them over Zoom. Users clicked through the prototype, with our focus being on how much they

learned, how they thought they were learning, and their general enjoyment with the experience.

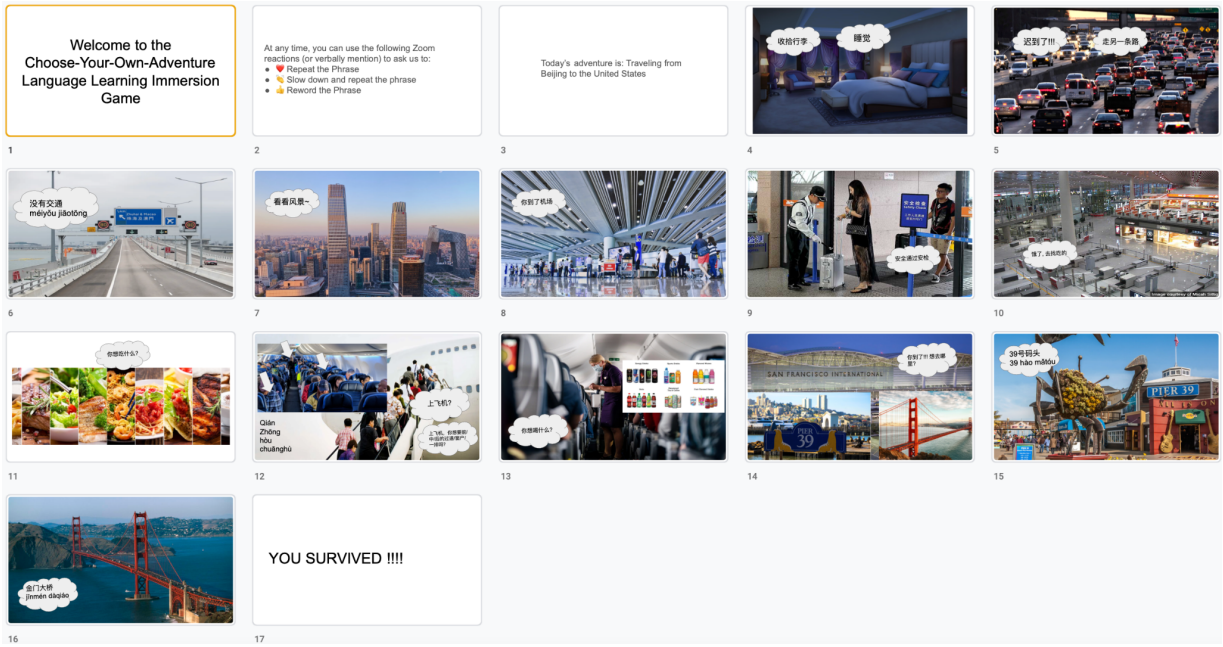
Choose-Your-Own-Adventure Game

This game's storyline focused on our user traveling from Beijing to San Francisco, having to traverse traffic, airport (and airport food), and San Francisco tourist attractions.

We assumed that users would be encouraged to learn more of the language by activating their survival skills, which meant placing them in a setting that involved them to be quick and react in order to travel successfully.

Our initial assumption was correct, with the main issue we found being that people relied too heavily on context clues. Once they got past that scene, they didn't retain the vocabulary or other information.

Photo of Google Slide Deck for Experience #1



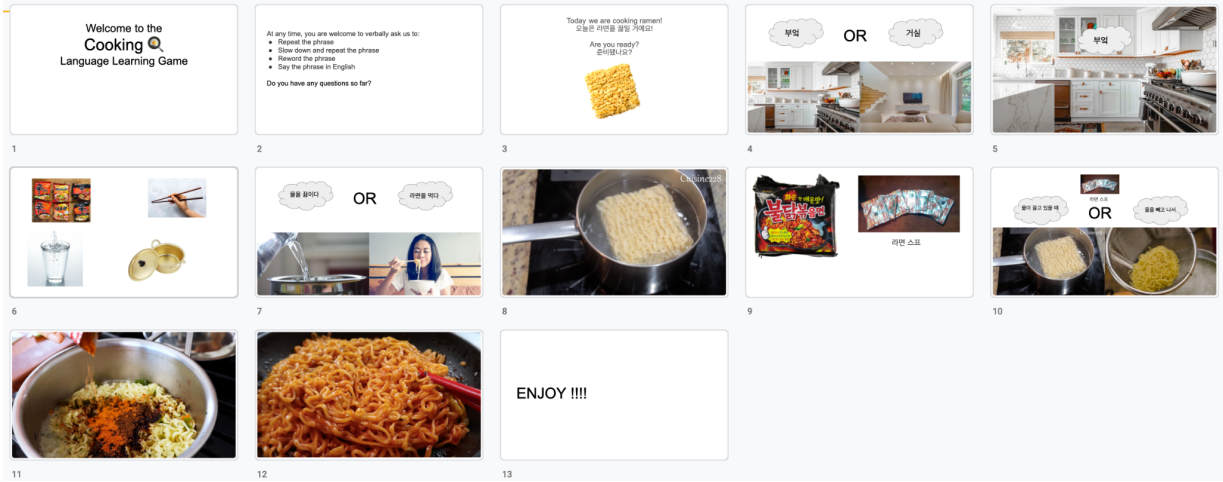
Cooking Game

This game's storyline focused on our user cooking a meal with the guidance of a chef, specifically cooking a traditional meal tied to the language they are interested in learning.

We assumed that users would be encouraged to learn more of the language by relying on a core skill, one that will also activate their survival skills.

Our initial assumption was correct, but the main issue seemed to be that users felt that cooking vocabulary was too niche, or not as useful as they would like it to be.

Photo of Google Slide Deck for Experience #2



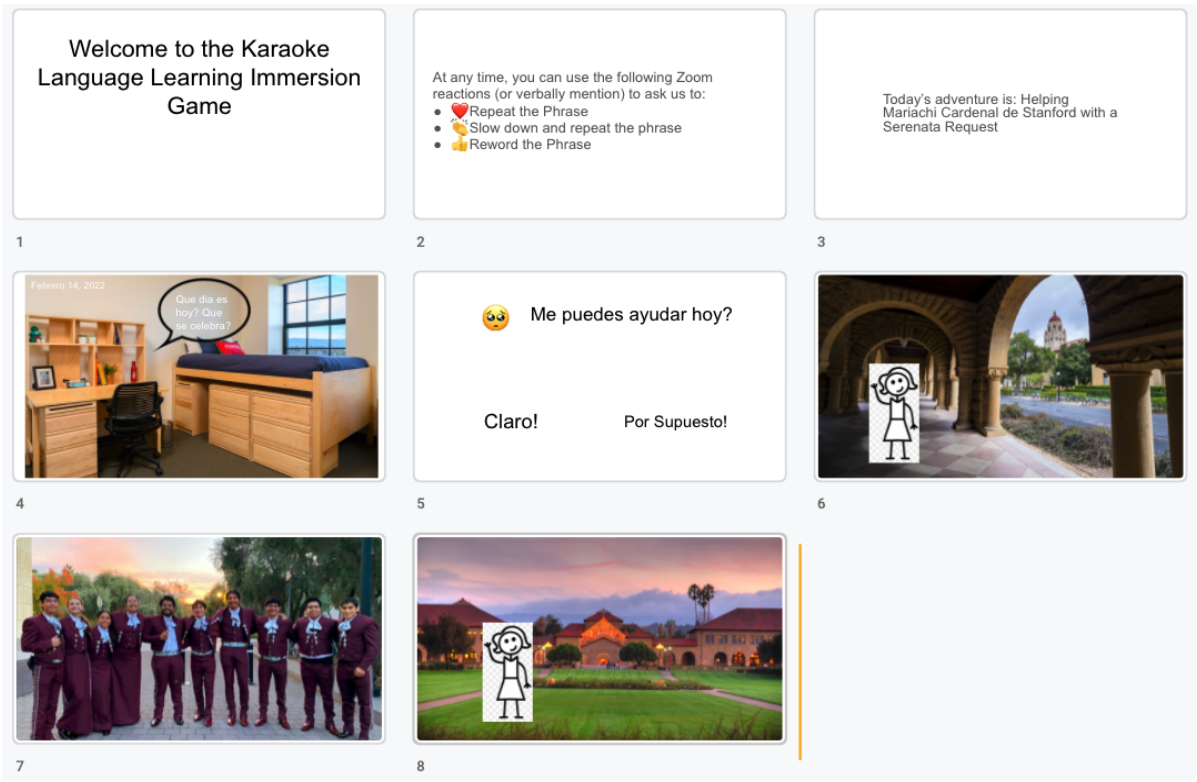
Karaoke Game

This game's storyline focused on our user working with Mariachi Cardenal de Stanford to take a serenata (serenade) to one of the member's Valentine's Day date. Once they are at the serenata, the user and member sing a song together.

We assumed that users would be encouraged to learn more of the language by engaging with pop culture and generally a more fun experience. Many people enjoy karaoke so we thought that could help us out here.

Our initial assumption was correct, the user enjoyed the story and the general experience. However, they felt that the theme of the song, which was very romantic, provided vocabulary that was not very useful in the real world.

Photo of Google Slide Deck for Experience #3



Design Evolution

From our experience prototypes and previous interviews, we came to the conclusion that users needed a language learning experience that was both immersive and applicable. Language that only helped them in one specific scenario, or the ability to rely on outside sources, hindered their learning and hindered how they applied the languages they were learning to their everyday lives. To achieve complete immersion, we turned to virtual reality (VR). Through a VR headset, we could transport users to different countries, and encourage them to only utilize the in-platform resources to learn the language. Based on these ideas, we set up three main tasks that would allow users to achieve their goals.

Three Tasks

Simple Task

Understand: Comprehend simple phrases in a language of interest.

We chose this task because understanding simple phrases is often the gateway into a new language. These phrases allow people to become more comfortable and develop the basic building blocks of the language.

Moderate Task

Produce: Read and write common statements (name, introduction, etc.)

Once you can understand, we need to encourage people to create and articulate their own thoughts in a new language. By relying on common statements, we can help people develop skills they can use in their everyday life.

Complex Task

Engage: Answer questions and follow instructions (without context clues).

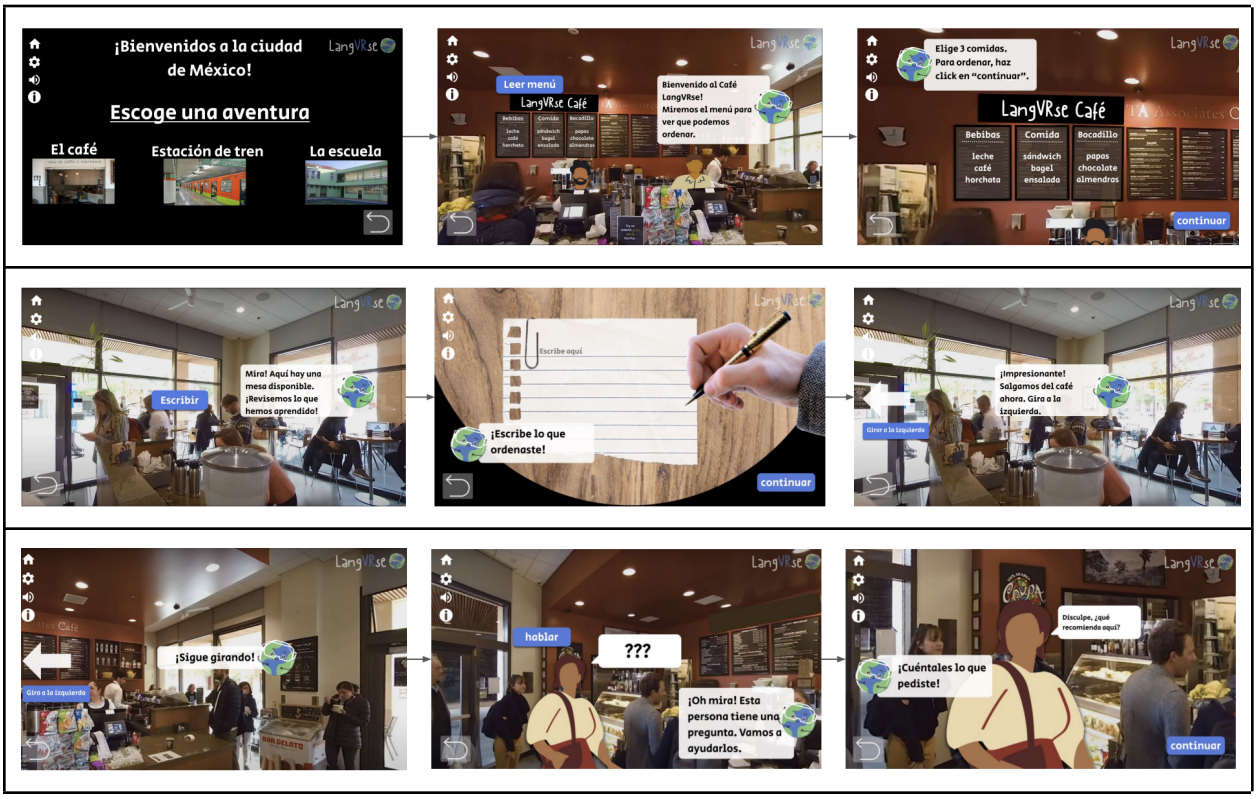
Although context clues are helpful, over-reliance on the clues you are provided acts like a crutch, prohibiting the ability to discuss further than what's around you. We hope to push past this and further deeper engagement.

Design Ideas Over Time

Initial Concept Sketches

Lo-Fi Prototype

Medium-Fi Prototype

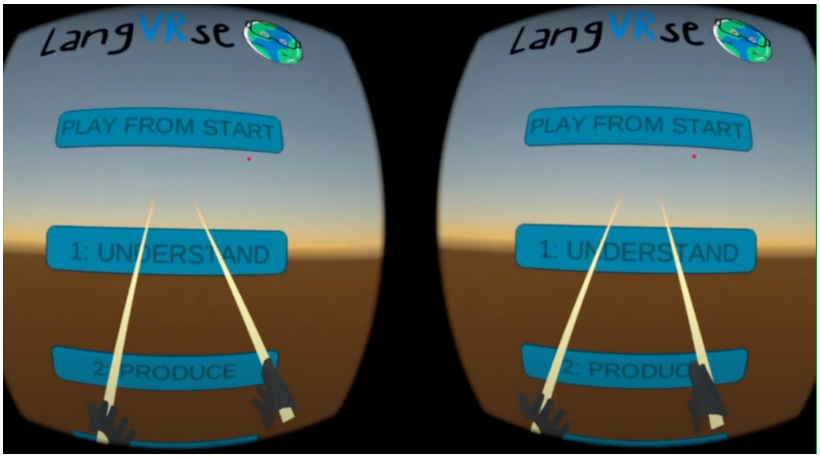


High-Fi Prototype (Detailed)

Based on feedback from our peers, we re-designed and implemented our three tasks in VR. Due to changes in platform, we saw some extreme changes in how the user interacted with the software and how they achieved these goals.

Simple Task

To accomplish this task, users had to enter the world, read the general instructions, move towards the menu, and then read the menu.



First, the user begins at the opening page.

Here, they can select between the different tasks they'd like to work on.

In this case, they will click "Play from Start" to kick off our adventure.

Next, the user will be greeted by two welcome messages.

The right message tells them that they may exit the game at any time by hitting the oculus button.

The left button welcomes them to the story and tells the user to begin by reading the menu.

If the user doesn't understand Spanish yet, they can **pull up the translate option** through the menu button on the left controller.

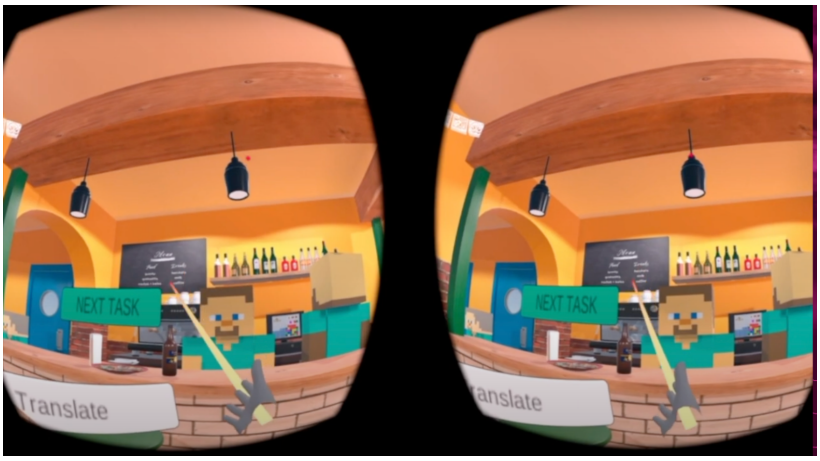
They can then **click translate and see the signs change** for them.

To return to spanish, they simply click translate again.

Now, the user can **walk around the restaurant in search of the menu**.

They can do so by physically walking around or by teleporting using the triggers on the controllers.

Once the user has found the menu, they can **read the food and drinks** that the restaurant offers.

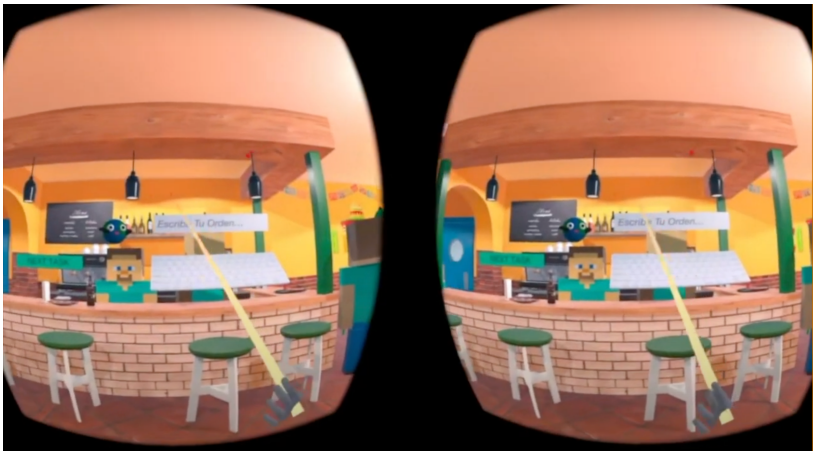


If needed, they can follow the same **translate instructions** as before to translate the menu.

Once the user has finished reading the menu, and feels they have understood. They can **select the next task button**.

Moderate Task

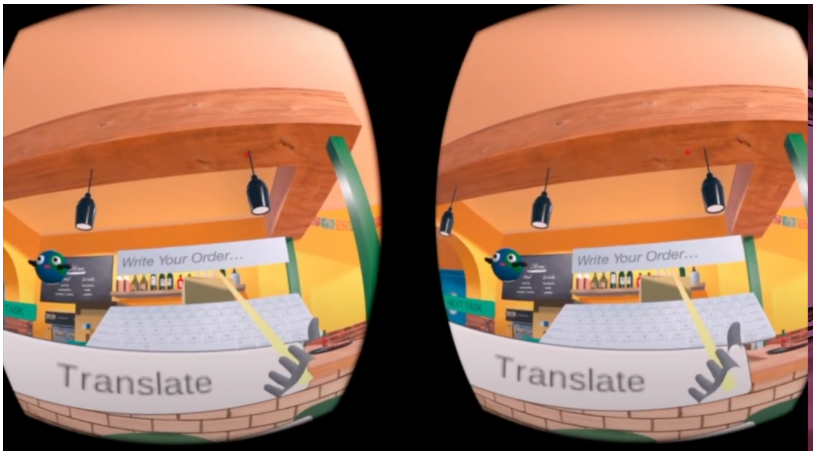
To accomplish this task, users had to type their order into the keyboard and order their food. They should utilize the vocabulary / food items they learned in the previous task.



The user will be teleported to the current position and **the keyboard will appear** for them to interact with.

The user should then **type in their order** by clicking the keyboard.

This feature was a Wizard-of-Oz feature so they keyboard did not actually pick up user input.

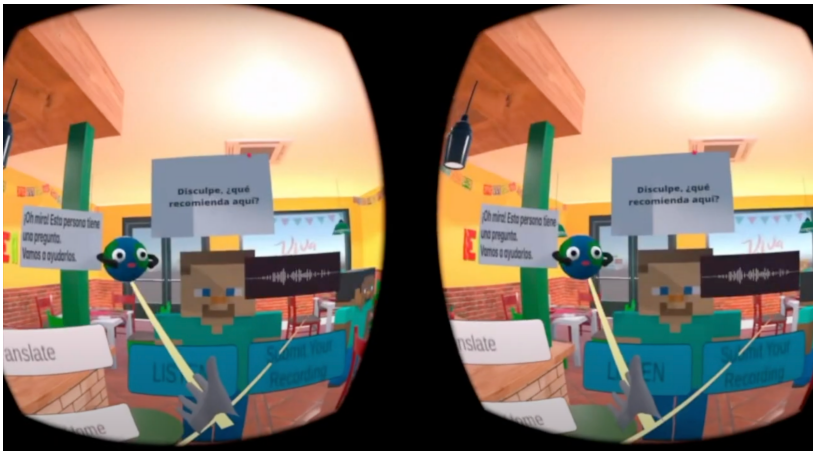


If needed, the user can follow the same translate instructions as before to **translate the instructions**.

Once the user is done inputting their order, they can **click the next task button** to the left to move forward in the adventure.

Complex Task

To accomplish this task, users will listen to a question posed by another restaurant-goer, and then record their feedback as a response.

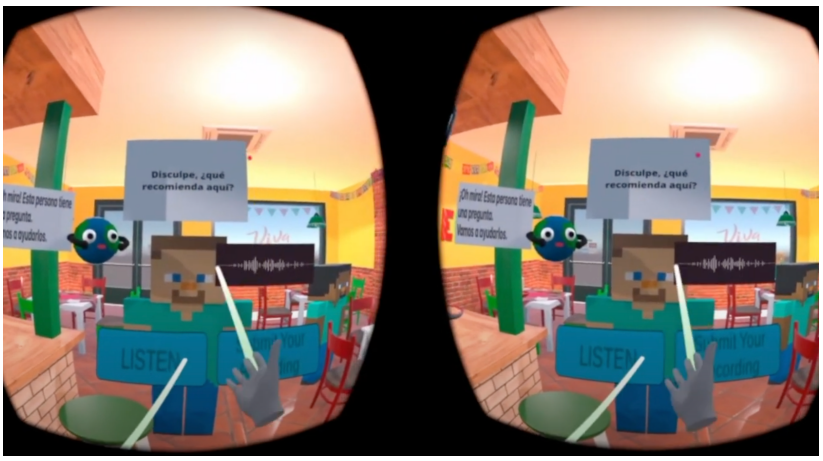


Another character in the game will **ask the user a question**.

Langu gives instructions while the character has their question written above them.

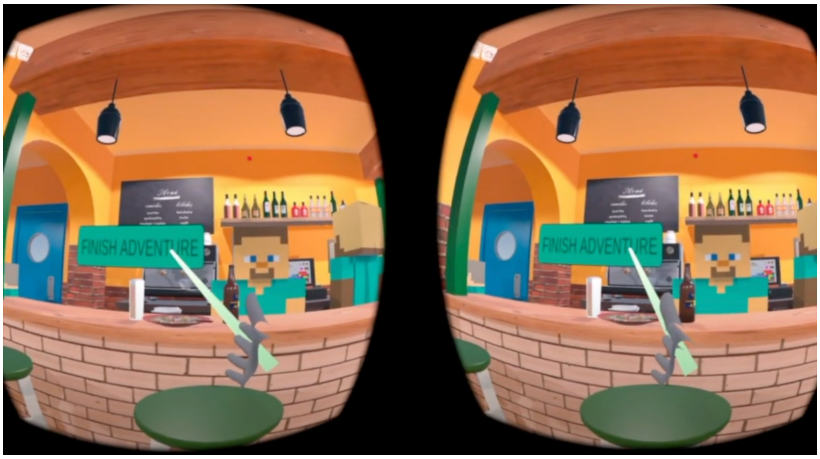
If needed, the user can follow the same translate instructions as before to **translate the instructions**.

The user can **listen to the question** by clicking the listen button.

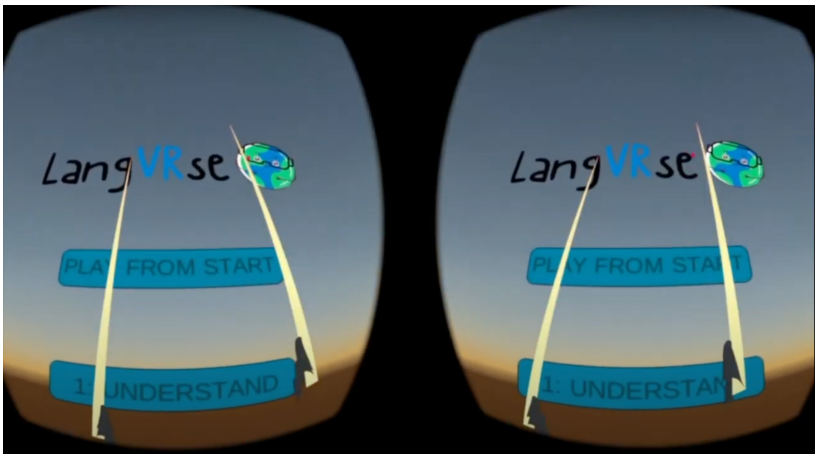


The user can **record their response** by clicking the bottom right button.

A successful response is showcased through the audiowave.



After the user has finished recording, they can **click the finish adventure butto**n to exit the world.



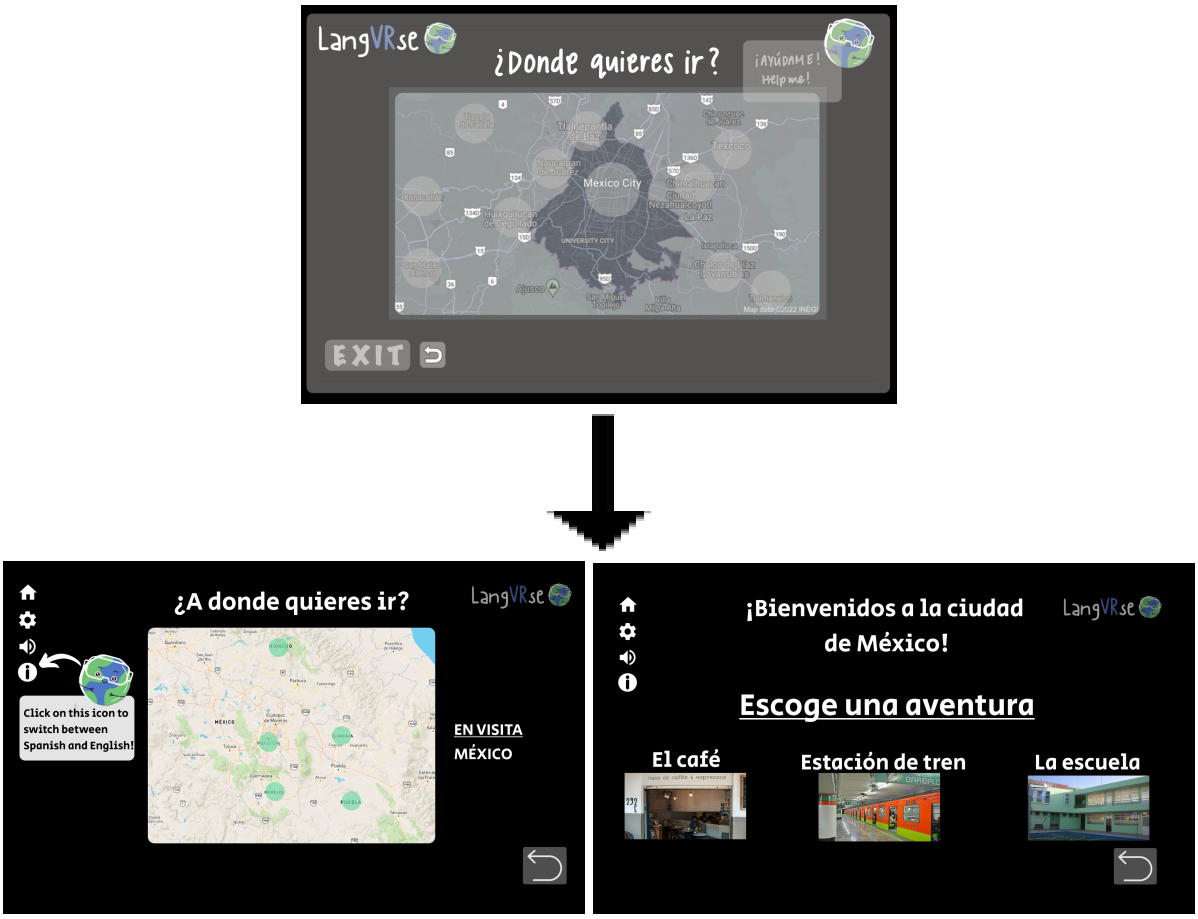
The user will then be **returned to the home page** / intro screen.

Design Changes

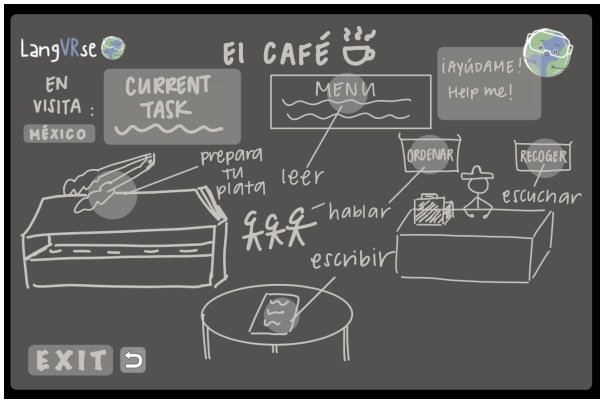
We iterated many times as we explored different platforms and changes between feedback and other deeper understanding.

From Low-Fi to Med-Fi

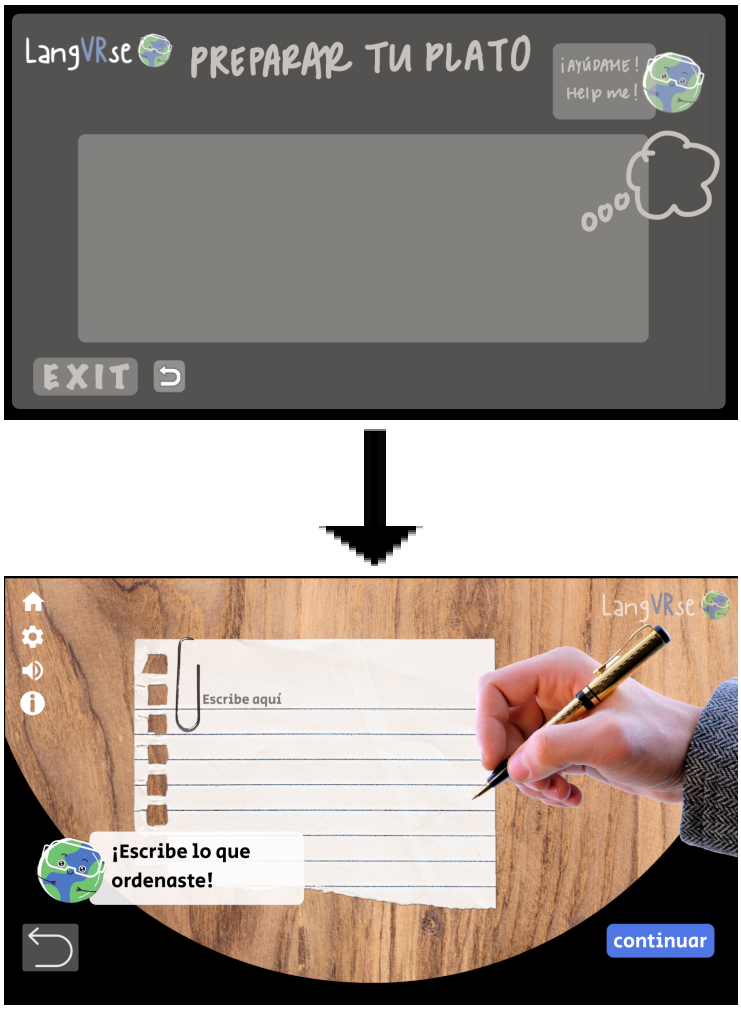
- More pictures of the country/location visited
  - Users wanted to learn more of the culture behind the place
  - Users wanted to really feel like users were visiting the place they were supposed to be at



- Strictly ordered tasks
  - Users were confused by the free choices between tasks
  - Users would complete tasks in an order that didn't help their learning between different tasks
  - Users would forget which tasks they had already completed



- More specific adventure rooms
  - Users were confused by which items they could interact with
  - Users were offered too many choices



From Med-Fi to High-Fi

Severity 3 Violations

H1: Visibility of System Status

Specifics: During the points in the adventure when a user is supposed to speak, there is no indication that shows that the user's speech is being picked up by the application. For example, the "What would you like to order" screen asks the user to order and then click "continue". There is no confirmation or feedback that the order has been heard.

Result: We included an audiowave during the recording activity to showcase this confirmation of us "hearing" and "saving" their response.

H2: Match Between System and World

Specifics: The icon to switch between Spanish and English is a filled-in circle with the letter "i" in the middle. However, this looks like an "info" icon, so users may intuitively think that clicking it will provide more information about the page they are on or about the application, rather than functionality to switch between languages.

Result: In VR, we eliminated most symbols/icons and instead stuck to clear text to specify what was meant. We flat out said "translate" here.

H2: Match Between System and World

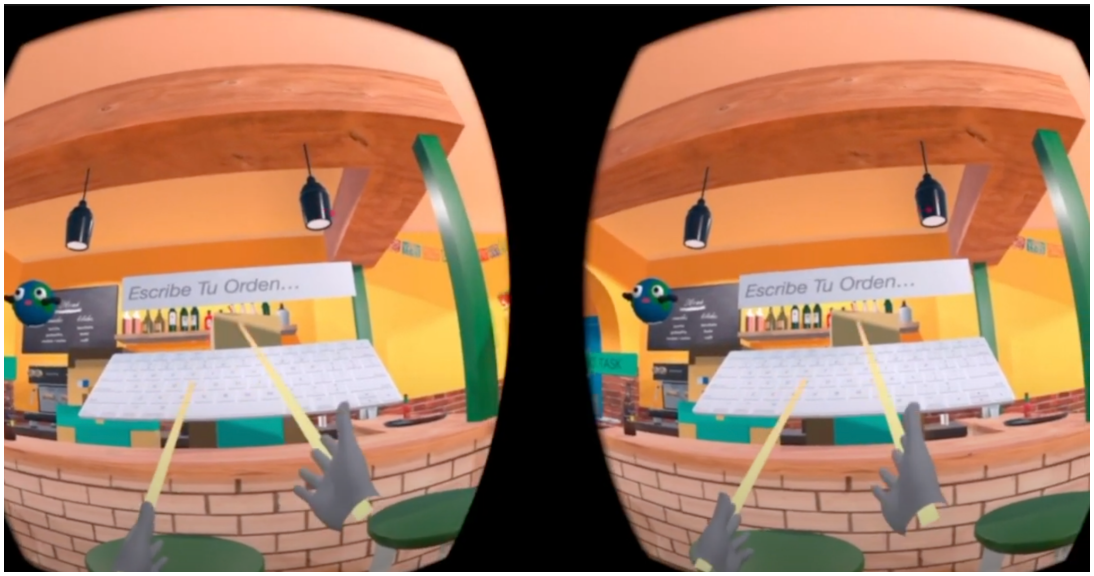
Specifics: The wording of “Click again to go back and continue” on the “where do you want to go screen” is vague (what does “go back” and “continue” mean?). Users may not find these instructions descriptive or intuitive.

Result: Because of project limitations, we didn’t have as many starting screens, so the screen this comment was talking about was not included in the final cut.

H3: User Control and Freedom

Specifics: During the writing exercise, users could make an error during writing and should have the option to clear their writing upon starting.

Result: Because we used a keyboard as a form of input, users can easily delete/backspace to clear their input.



H3: User Control and Freedom

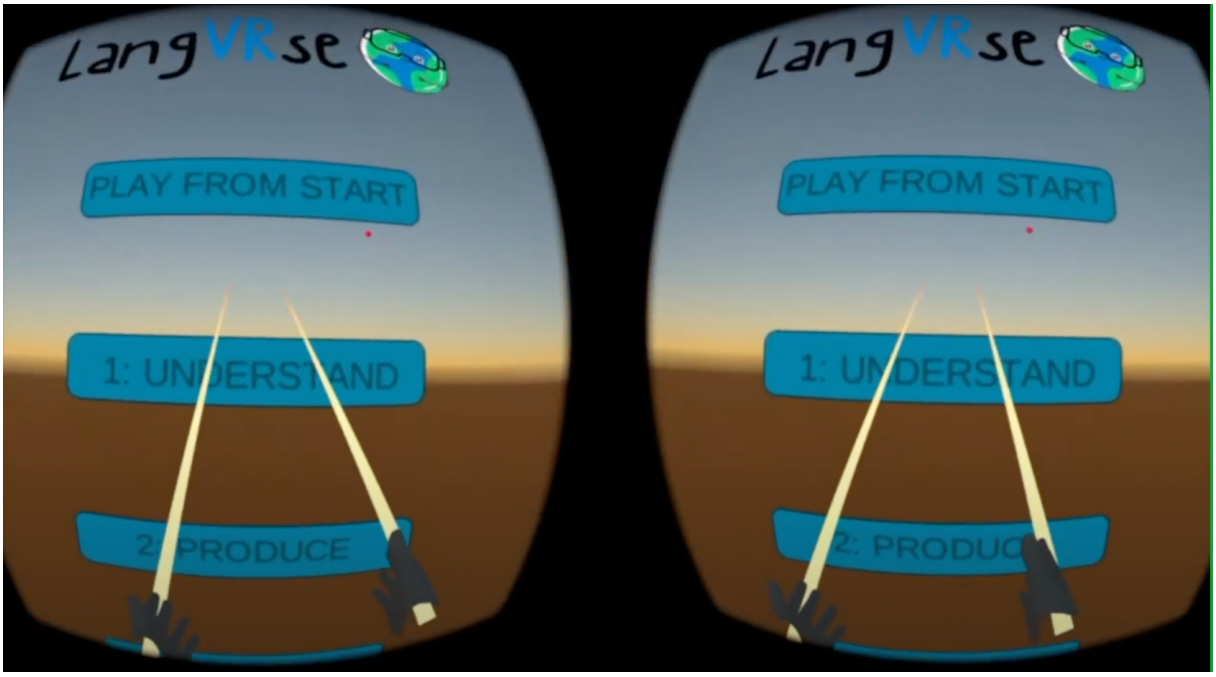
Specifics: There is no Logout button for the application. There are only Back buttons from a single screen to the previous one, and a Home icon.

Result: The user can log out using the oculus home button that will allow them to completely exist the app.

H3: User Control and Freedom

Specifics: In the linked prototype, it is not possible for users to save the game until they successfully finish the entire adventure at a given location. This means if they are unable to finish the entire run for an adventure, they would have to restart again from the beginning the next time they come back to it.

Result: Users can now return to different tasks in the adventure by selecting that specific task in the home menu.



H8: Aesthetic and Minimalist Design

Specifics: When the user switches to English, all clickable buttons on English pages are still on the screen but are not clickable (required switching back to Spanish). The user might be frustrated as they look like buttons but are not clickable.

Result: Buttons can be clicked from both english and spanish translations now. So there is no longer that frustration there.

H8: Aesthetic and Minimalist Design

Specifics: After the users have completed an adventure, it navigates users to a page titled “Your Stats”; however, the page is very busy, and also shows a 2x2 grid of Next Steps which are not stats, unlike the page’s title suggests.

Result: Because of project limitations, we didn’t have as many ending screens, and the my stats screen did not make it to the final prototype.

H8: Aesthetic and Minimalist Design

Specifics: On the Welcome page, there is a “Continue Last Session” button, in addition to a list of continuing/existing users. However, users logging back in would presumably select their respective account, which should already save their last session, so it is unclear what user account the “Continue Last Session” button would

lead to and whether it is really necessary.

Result: Because of project limitations, we didn't have as many starting screens, so the screen this comment was talking about was not included in the final cut.

H10: Fairness and Inclusion

Specifics: Setup page does not have an option to indicate the level of experience which can cause users to be confused and make mistakes, especially when the instructions are in the language they are trying to learn. The users might not feel like they can use the app if they are beginners.

Result: Because of project limitations, we didn't create multiple prototypes for different levels of difficulty, so we had everything at one level.

Severity 4 Violations

H3: User Control and Freedom

Specifics: After saving, on the "Looks like you've finished playing" screen, there are no buttons to go back to the home screen and restart the program. The user might feel frustrated if they want to play again.

Result: After they have finished the adventure, the user is taken back to the main menu, so they can now select the adventure again if they'd like to play again.

H12: Fairness and Inclusion

Specifics: The "switch between languages" component defaults to English, which is unhelpful to non-native English speaking populations. Users might feel like the design is not meant for them and their goals (learning a language without any experience).

Result: Because of project limitations, and our own linguistic capabilities, we didn't create multiple high-fi prototypes for different languages / language combinations.

Values in Design

Respectfulness

Our first value of respect. We wanted to ensure that we were respectful towards the culture and people associated with the language we are trying to teach.

This value is embedded in the final result by using a true Mexican resturant, specifically in terms of architectural design of the space, the food items present, and the ambiance music chosen to fill the space. Each design choice was made with intentionality and the desire to make the space feel as real and authentic as possible.

Accessibility

Our second value is accessibility. We hoped to make it accessible to all (people from all socioeconomic, racial, and visible/hidden (dis)ability backgrounds.

We have made the game accessible by catering to different physical capacities, as the game can be played by both moving around the space, as well as in stationary mode, where one can use the controllers to navigate the space.

This value is also embedded in the final result by using characters with different appearances (hair color, skin tone, etc). A conflicting value here is that there is lack of female/feminine characters in the space (as they're all versions of the Steve character from Minecraft). We did not have a chance to find other feminine cartoon-like characters for our game during the end of the course.

Affordability

Our third value was accessibility. We wanted to ensure that we did not exacerbate current educational inequalities further, and wanted to make our platform easily financially accessible by all.

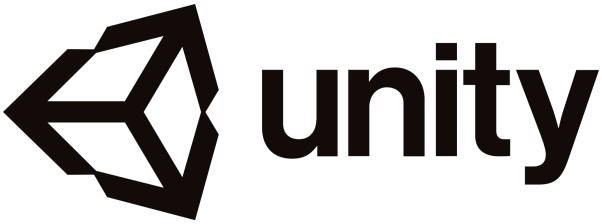
This was a conflicting value for us, as we used Oculus headsets that not many people can afford (and that many low-income individuals or low-income schools would not have access to). To run the application, we also relied on different paid services (for

memory, assets, etc.) that many could not afford for long-term engagement. Lastly, we used advanced computers to develop and run the program, which is also something that many people did not have access to.

We are lucky to now have access to these materials, as we all come from First-Generation/Low-Income backgrounds where we wouldn't be able to do this project before Stanford, so we understood the perspective we were trying to provide for. However, we sadly we did not dive into other alternatives for hosting our program, besides initial conversations.

Final Prototype Implementation

Tools Used



We used Unity as our main development platform, where we created the different scenes for our project and combined all of our elements.

Pros:
- Allowed us to develop all in one place
- Had storage and collaboration plans that worked for our project
- Compatible with Oculus head sets

Cons:
- Slow onboarding process
- Lots of tricky debugging

We used blender to create custom 3D elements for our scene, such as the buttons and text bubbles.

Pros:
- Amanda and Anna had experience so there was low learning curve.
- Relatively simple for small elements.

Cons:
- Takes up a lot of band width on the computer, so you cannot run Unity and Blender at the same time.

We used asset libraries and the Unity asset store to use pre-existing components in our application.

Pros:
- Saved time in development by utilizing other people's elements.

Cons:
- Not all elements are free so we had to pay money for things such as the restaurant.

We used Canva to create the graphic design elements that would be overlaid atop of our 3D elements or used within the game.

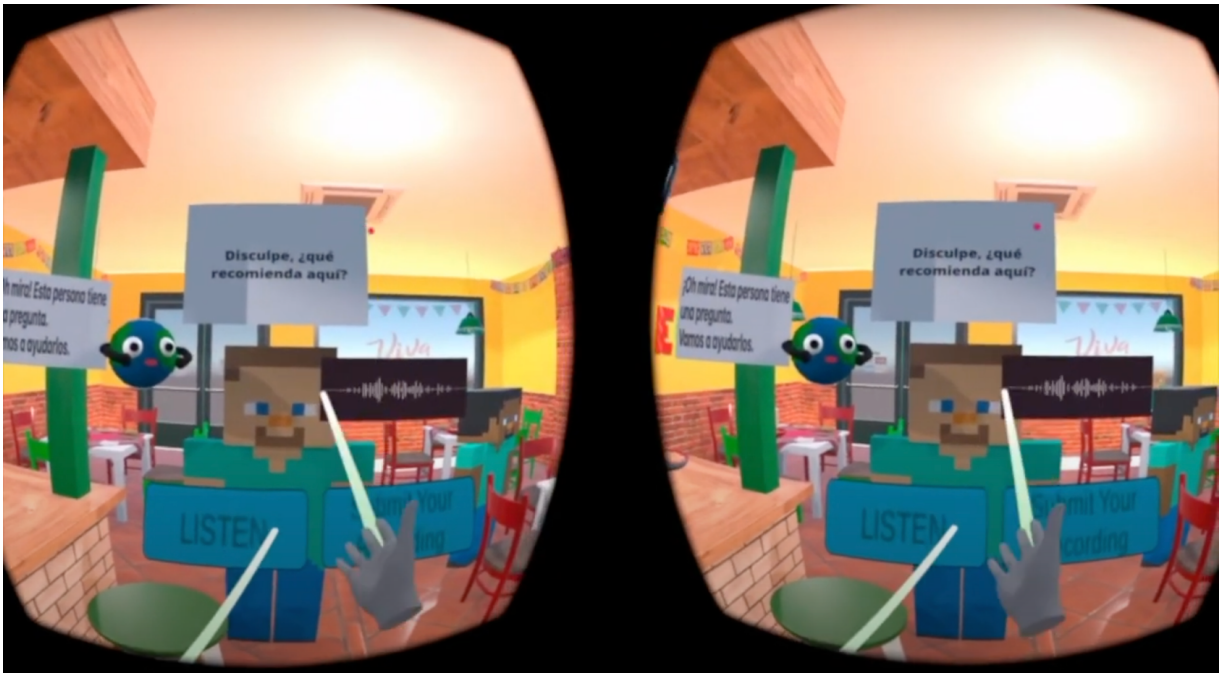
Pros:
- Many options with pro account to create beautiful and realistic designs

Cons:
- Cannot create 3D elements specifically in app, so all designs have to be exported and then changed later on.

Wizard of Oz Techniques

The keyboard used for our moderate task did not actually take user input, as it was a static elements. This means we just pretended that the user typed in their information before moving onto the next task.

The microphone for our complex tasks did not actually listen to the user, it just displayed an audiowave to simulate the experience. This means that no audio was recorded, so no feedback about the speaking could actually be provided to the user.



Hard Coded Data

Our main hard-coded data was the languages itself. Spanish and English were the only available options for users, and the responses from the other characters and Langu were limited to the built-in phrases in those two languages. Mexico was also the only option for countries to visit. These were limitations of our language abilities and other prototype constraints.

Other examples of hard-coded data include one set difficulty level, three set tasks, only one type of adventure, and components of the scene being static (such as not being able to move the food/chairs/etc.).

Summary and Next Steps

We have learned a lot over the course of this quarter. From initially having just a broad topic of “language learning” to now having a fully-functional VR application, we have been able to learn new skills through every step in the design process. We struggled greatly in the middle of this process, understanding our user’s needs and our final end goal, but not knowing how to capture the intricacies of VR in such small or limited prototype scales. Luckily, through a lot of hard work and dedication, we were able to make the final project capture the ideas we had had all along.

If we were to further this project, we’d like to add more languages options, deeper engagement in terms of learning options, and center on our values a little bit more (rather than being so centered on the deadlines). It’s only the beginning for our adventures with Langu, and we will see what the future holds for our LangVRse team.