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Gyri: Language Learning in the context of your life

by

Laura Woodrow

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Fine Arts in Visual Communication Design

School of Design, College of Art and Design

Rochester Institute of Technology Rochester, NY

August 11, 2022

Committee Approval

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Date

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Date

Co-graduate director of the Visual Communication Design, MFA / Thesis Advisor

Abstract

Many people want to reap the benefits of learning a new language, but your ability to pick up a new language decreases drastically as you age. Immersion is a successful method of learning a new language, much like children learn their native language. Current solutions mainly use spaced repetition through digital means, much like you would discover in a traditional classroom. However, mixed reality can be leveraged to provide an immersive learning experience to the user/s, creating a cognitive link between their environment and the language they are learning. Not only can this method of language learning create an immersive experience, but it also allows for contextual and relevant education to take place.

A greater understanding of learning and teaching methods will be reached through interviews with potential users, such as students, parents, and professionals. From there, further research into language learning, mixed reality, and information acquisition in terms of both psychology and design.

This project seeks to create a digital prototype of an immersive, mixed reality-based experience to create a more intuitive, immersive, and contextual language learning experience.

Keywords

Language Learning

UX/UI

Mixed Reality

Introduction

Learning a language is a skill required worldwide to communicate with those around you. Many people opt to learn a second language to widen their horizons and reap the many social and psychological benefits of learning a new language. Unfortunately, learning a new language can get increasingly difficult as we age, and many current solutions focus on irrelevant vocabulary and require a lot of mental effort. While many apps and language learning websites exist, there is a market gap regarding a language learning solution that is both immersive as well as contextual and relevant (Figure 1). What if we could leverage a mixed reality solution to bring the language information to the user in an intuitive, fun, and relevant way? Meet Gyri, language learning in the context of your life. Using tried and tested language learning techniques, including immersion, dual coding, and spaced repetition, image recognition software will generate 3D cubes to visualize the information within your environment.

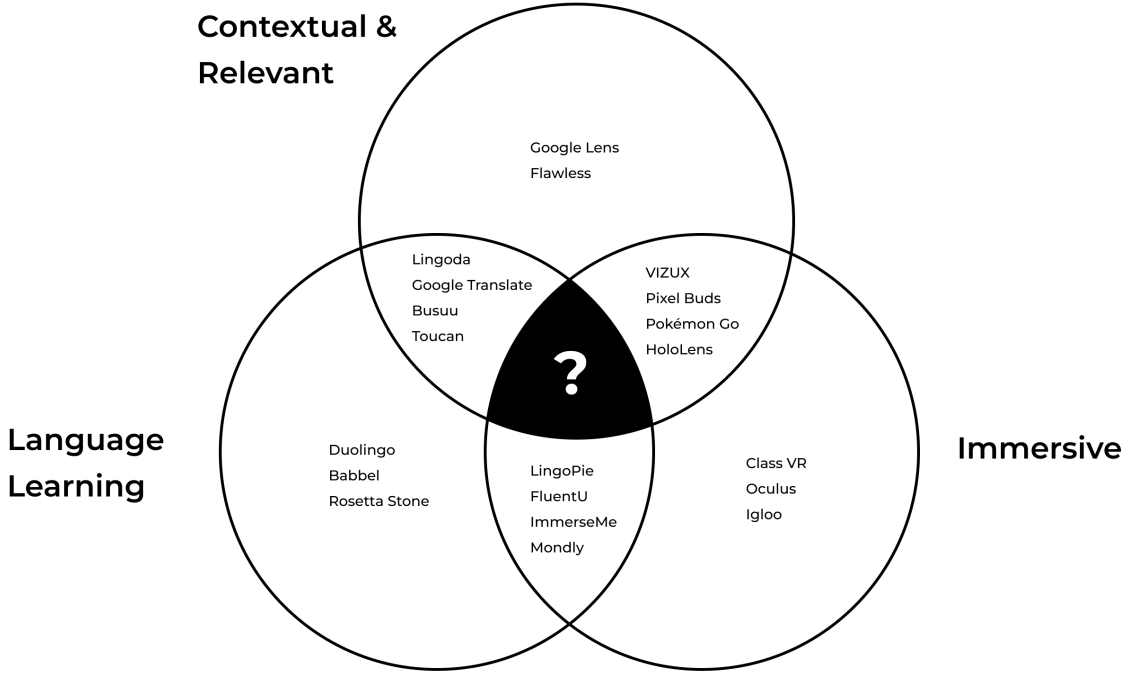


Figure 1: The market gap

Gyri: Language Learning in the context of your life

Many people want to learn a second language for a plethora of reasons; students taking required or chosen language classes, those looking to pick up a few words before or while traveling, professionals trying to communicate more effectively with others, and the list goes on. The benefits of learning a language include improved communication, enhanced problem-solving skills, better memory, and an enhanced worldview ("Key Points about the Benefits of Foreign Language Learning to Include in Letters to Legislators," n.d.). Many people want to reap these benefits, but the chance of becoming completely fluent in a new language plummets by the age of 18 (Hartshorne, Tenenbaum, and Pinker 2018). Immersion is a successful method, but most people can't move to a new country to learn the language. One school has found that through total immersion in the classroom, their students have gained similar proficiency to non-full immersion learning in approximately 50% less time ("Proficiency Gains | Middlebury Language Schools" n.d.). Immersion means the user is surrounded by the language they are trying to learn. True immersion would mean speaking, writing, and reading all in the new language and not using their native language. Immersion is only one recommended technique for successfully learning a new language. Another standard method used is spaced repetition while studying words. Cramming is ineffective; you may remember your list of vocabulary words immediately after studying them over and over, but you are likely to forget them soon after. Experts suggest spacing out your studying (Macri 2015), as each time you study, it will take less time to master the words, and long-term spaced repetition is the best way to memorize vocabulary long-term. Another method used is the idea of dual coding, the use of both auditory and visual cues, giving the brain multiple connections to what you are learning (Sumeracki 2019). For example, when trying to remember vocabulary words, it is helpful to both hear the word spoken as well as see the word in front of you to learn it long term.

Currently, many solutions exist in the language learning realm, mainly mobile applications and websites, though several virtual reality solutions also exist (See Figure 1). Of

course, there is also the traditional classroom language learning experience. Duolingo, Babbel, and Rosetta Stone are popular options. These short lesson-based programs lead the user through translating and speaking in the desired language. These function much like a classroom setting lesson, where the lessons and vocabulary are set. However, their use of shorter form lessons, allowing for spaced repetition, is often more convenient and viable, if not more effective, for those who don't have the time or money to spend on a classroom-based language class. According to Matthias Allgaier, the bilingual Managing Director of Summit Partners, a respected American private equity firm, "The language learning market is increasingly shifting to online offerings that provide consumers with a more convenient, flexible, and cost-effective way to improve their foreign language skills" ("Lingoda Announces \$68 Million Growth Equity Investment from Summit Partners" 2021). Other solutions utilize virtual reality to simulate a conversation with a native speaker, such as Mondly and ImmerseMe, though these also are set lessons and vocabulary words. More relevant and contextual options exist, such as Toucan, which translates random words while you browse the internet. However, it doesn't allow for immersion as it places translated words among words in your native language. Gyri is the solution that seeks to solve this gap in the market, combining language learning with mixed reality to create an immersive environment and allow for relevant and contextual learning for the user. Utilizing current image recognition software used by Google Lens, Gyri identifies the objects around you and translates them in real-time into your desired language. Simply point your mobile device, click on the object you want to learn and watch a box pop up to give you the translated information.

Interviews were conducted to understand the needs of language learners and the pain points that arise with current solutions. Multiple types of users were interviewed, including a student, a stay-at-home parent, and a professional in the engineering workspace. It was found that the interviewees often referred to the issues that arise with learning irrelevant vocabulary they have no use for and issues with long-term memorization. For example, the student found that the set vocabulary taught in the classroom wasn't very useful and that their memory of the

language quickly diminished after taking the class. The stay-at-home parent wanted a more flexible option that didn't require the time commitment of an in-person class while also hoping for a simple-to-use interface as they aren't as tech-savvy. The professional found that they only needed to learn industry-specific words to be able to communicate, and the current solutions just weren't cutting it. Overall, the user wants an intuitive interface, lessons/vocabulary that is relevant and useful to them, with a flexible time commitment.

By using the information found on language learning techniques, user needs, and the current market gap, I arrived at the project goal. This project aimed to create a language learning experience utilizing mixed reality to bring an immersive and relevant learning environment to the user. The solution should allow for immersion, spaced repetition, and dual-coding. Initially, the idea of immersion led to the display of information within the environment itself, utilizing mixed reality (MR). Mixed reality allows for immersion within the user's daily environment, helping to create a truly immersive environment. Design should be minimal as not only will it need to be overlaid through MR, but it also shouldn't distract from the environment around the user other than to display the information. The idea of using cards to display the information was explored and led to the collection concept. Much like trading cards, could these vocabulary cards be collected? How could they be interacted with within the space around the user? Through discussions, it became apparent that the use of cards didn't lend itself to the idea of using mixed reality. What would make this different from using physical flashcards other than the image recognition? Is there a way to integrate the information better into the environment? Iterations on the information display, card iterations, and 3d text were explored, and eventually, the box form was decided. The box makes sense as a 3D asset within the 3D space and allows for different pieces of information to be displayed on each side. Utilizing the different sides of the cube creates an opportunity for dual coding while not overloading the user with information. Multiple iterations were explored regarding the visual design, branding, and user interface (UI) overall. The UI was simplified to minimize distractions and create a truly immersive experience until it had everything essential to the user and nothing

more. Initially considering a profile section along with collections, this was removed to simplify. Blue was used originally in branding, but when working with overlays within MR, it was found that a neutral color such as black or white would be more visible when overlaid over the environment. The collections section was also iterated on, originally showing a lot more data about the user's memorized or not memorized vocabulary, but it was found to be much more important to display the words themselves rather than focusing on the data to keep the experience fun rather than like a test. Instead of "test," the word "play" is used to describe the user's interaction with the collected words and the environment around them to practice their vocabulary memorization.

Gyri allows users to explore, collect and play while interacting with their chosen language in the space around them through mixed reality. Explore enables the user to walk around their space and click on anything they want to learn, prompting a translation box to pop up from the object, giving them information on each side: the word in English, a graphic icon, the word in the chosen second language, as well as the option to listen or add the word to your collection. The different types of information allow for dual coding when learning, and the ability to collect allows for spaced repetition. Collections are kept within the collection icon in the lower right of the UI, where the user can explore their saved words, categorized for easy finding. Play gets the user to interact with their saved collections. Users can select their chosen category to test their knowledge within collections. Once selected, the user is given randomized cubes from their collection, which they must throw onto the correct corresponding object. If the user is incorrect, the cube glows red; if correct, it glows green. Results are kept as general data in the collections tab by category and by word.

Gyri fills the market gap for an immersive and contextual language learning experience, allowing users to use essential language learning techniques, including immersion through mixed reality, spaced repetition through collections, and dual coding through the use of the cube form to display information. Overall, bringing the relevant information to the user intuitively and flexibly solves the pain points users experience with current language learning

solutions such as apps, websites, and in-person classes. For further development, exploring mixed reality using MR glasses could be interesting. While explored initially during development, it was thought to be outside the realm of use for the current average user. In the future, MR glasses may become more popular. Even if not used by the average user, Gyri could be implemented in specific training situations for companies, allowing them to fully customize the language learning experience for their employees. Image recognition is currently in use, notably by Google Lens, though the accuracy is not at the level Gyri requires. Image recognition abilities required by Gyri make this a futuristic user interface, though it will be possible in the near future.

Conclusions

Gyri fills the need for an immersive and contextual language learning experience and explores the process of designing intuitive and effective methods of communicating information for long-term memory within a mixed reality environment. The research regarding language learning, user experiences, and needs lead to further exploration of the method of displaying the information in 3D space. The cube allows not only for an immersive experience, with the user interacting with 3D mixed reality elements within their environment, but also for the use of dual-coding to solidify the user's long-term memory through different pieces of information displayed. Language learning has only broken the surface regarding augmented reality experiences, but those experiences don't integrate the digital and real worlds. By merging the digital assets with the physical world around the user, the user can become familiar with the world around them without distraction taking away from the immersive nature of Gyri.

Further exploration can be done into the mixed reality and the current limitations of image recognition software. Designing for an everyday user versus designing a language learning experience for a business will yield different results, as needs will vary. Gyri focused on the standard user seeking to learn a new language for fun, school, or any other personal/professional reason, rather than a company developing this for training. This raises the question of what would be necessary for users in different contexts and how would it affect the overall design and UI? Although Gyri focused on a more generalized user group, the research and design iterations led to a universally usable language learning experience, allowing for language learning in the context of the user's life.

Appendix A

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Appendix B

Semplice Project Page

<https://designed.cad.rit.edu/vcdthesis/project/gyri>

Gyri

Gyri

[jahy-rah-y]

Language learning in the context of your life.

Learn a new language through a **context based** and **immersive** mixed reality platform.

Mixed reality can be leveraged to provide an immersive learning experience to the user, creating a cognitive link between their own reality and the language they are learning. Not only can this method of language learning create the immersive experience, but also allows for contextual and

Duration

Aug 2021 – Aug 2022

Committee

Mike Strobert
Adam Smith

Design Tools

Maxon Cinema 4D
Adobe After Effects
Figma

How can a mixed reality based experience be leveraged to bring an immersive language learning experience to the user within a relevant context?

There are so many benefits to learning a new language...

Learning a new language has many cognitive benefits, as well as social benefits through connections with new people and cultures.

- + Improved communication
- + Enhanced problem solving skills
- + Better memory
- + Enhanced worldview

...but it's so hard!

Many people want to reap the benefits of learning a new language, but, your chance of becoming completely fluent in a new language plummets by the age of 10.

Immersion has been found to be a successful method, but most people don't have the ability to move to a new country to learn the language.

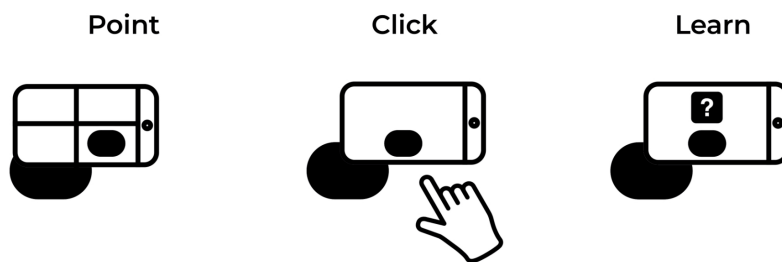
One school* has found that through full immersion in the classroom, their students have gained similar proficiency to non full immersion

learning in approximately 50% less time.

The Solution

With Gyri, simply learn a new language in
the context of your life.

Through the use of image recognition, simply **point** your phone at an
object you want to learn in a new language, **click**, and **learn**!



Explore.

Learn the words that are relevant to your own life. Simply pick up your phone, point and click on what you want to learn, and watch the translations **immerse** you through augmented reality (AR).



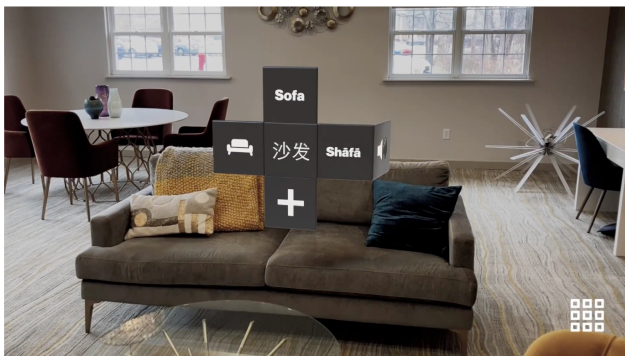
- + Point your phone at the object you want to learn
- + Click on the object to see translation cube hover above



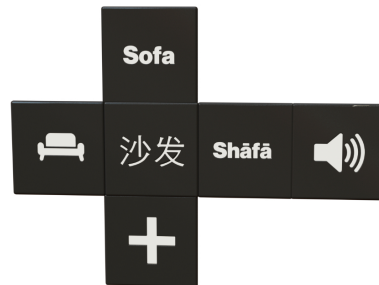
- + Explore the world around you
- + Click on any object to see how to write, pronounce and read it

Collect.

Curate your own cube collection to catalogue your progress or save for later. The AR platform allows for the use of 3D cube sides to give pieces of information. This is a **dual coding** approach (both hearing and seeing information) that is key when learning a new language.



- + Click on a cube to unfold to see all sides at once
- + Click + to add cube to your collection



- + Each side of the cube shows a different piece of information
- + Move around the cube in 3D or click to see cube unfold

Play.

Chose your collection and play to test your knowledge. Match your chosen cubes to the item in real life. This allows for **spaced repetition** as well as solidifying context behind the vocabulary.



- + Select your collection you want to play
 - + Stats for the collection are shown
 - + Green = words you have gotten correct on the first try
 - + Red = words you have gotten incorrect on the first try
 - + Click play to begin
- + Throw cubes onto the correct object.
 - + Glow indicated if correct (green) or incorrect (red).

The Process

Topic Research

Language Learning

There are multiple tried and tested techniques for successful language learning. In particular, **immersion** is one of the most effective methods of language learning.



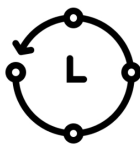
Immersion

Immersion is much like the way children learn their own native language. By fully immersing yourself on a daily basis, you can constantly be learning new words.



Dual Coding

The theory states that having both verbal (hearing) and visual (seeing) input helps the user to remember, long-term, the information being presented to them.



Spaced Repetition

A proven memory technique consisting of repetitive reviewing of words, so that eventually the interval between review can become much longer while still remembering.



Study Every Day

Immersion in the language on a daily basis is important. Practicing daily will help the user to keep their memory sharp and remember words faster.

User Research

User Interviews

Potential Gyri users were interviewed to further understand the pain points of current language learning solutions, as well as specific needs of different types of users.



The Student

"I have a hard time learning Spanish long term, after a semester at school **I have forgotten all of the new vocab.** I have **no use for the random words** taught to us in class either."



The Stay at Home Parent

"As a mom I focus most of my energy on taking care of my newborn, but I want to be able to keep my mind sharp. I'd like to learn a new language but **I don't have the time** to attend a class, and I find a lot of the language learning apps **a little intimidating.**"





The Professional

"My job requires me to travel quite often, and I find myself having to learn select words in many different languages. I need a way to **learn the relevant words** to be able to communicate with the locals."

Key Findings

Users Don't Want:

- ✗ Complex interface
- ✗ Random irrelevant vocabulary
- ✗ Long lessons
- ✗ Work

Users want:

- ✓ Intuitive Interface
- ✓ Vocabulary relevant to them
- ✓ Flexible time commitment
- ✓ Fun to use

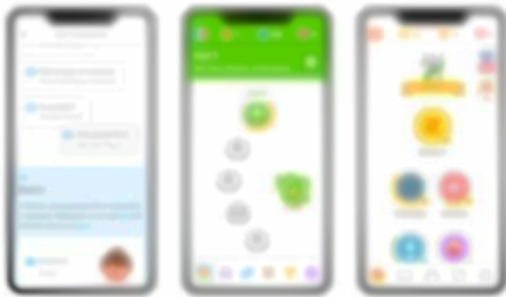
Market Research

Current Solutions

There are many language learning apps, websites, and even VR and AR experiences. These current solutions leave a **gap** that Gyri aims to

fill. An immersive language learning experience that is relevant to the context of your life.

Augmented reality can be leveraged to provide an immersive learning experience to the user/s, creating a cognitive link between their own reality and the language they are learning.



DuoLingo

A free language learning application that utilizes short "bite sized" lessons, allowing users to easily learn in their downtime.

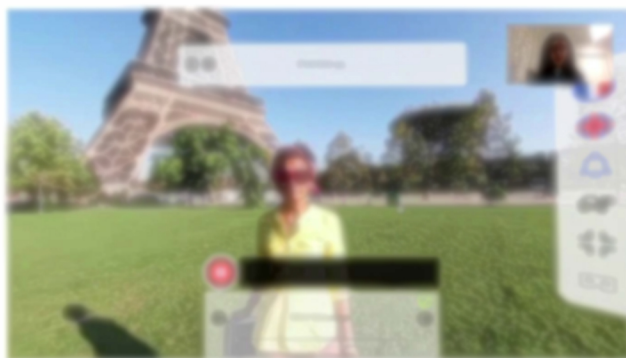
Immersion is not a part of this application, as it only exists on your device, and doesn't interact with the physical world other than recording your voice.



Google Lens

Scan something in real life with your phone, and instantly have the ability to search on the web.

Using image recognition technology, this app can find relevant information to what you are seeing in front of you.



ImmerseMe

A VR experience that gives a more comfortable speaking experience for new learners, allowing for less pressure on the learner to get it right. The user is placed in a 360 view of an interaction.

Realistic conversations/interactions are explored through VR.



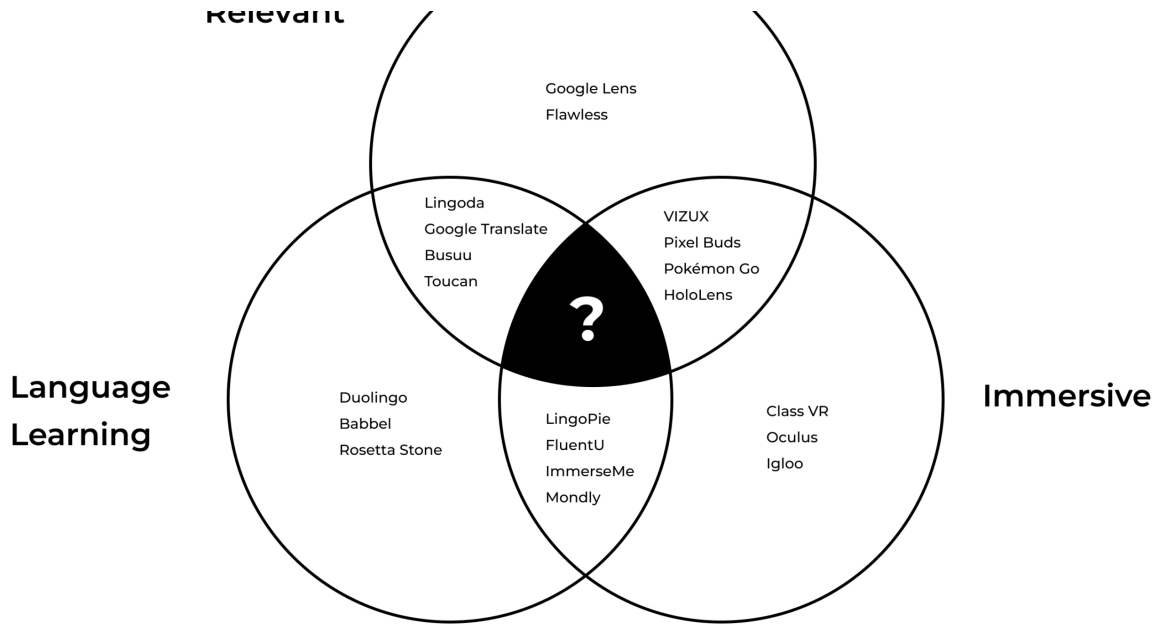
Toucan

A browser plug-in that translates random words on the webpage you are browsing.

Allows for contextual learning, in a passive way.

**Contextual &
Relevant**

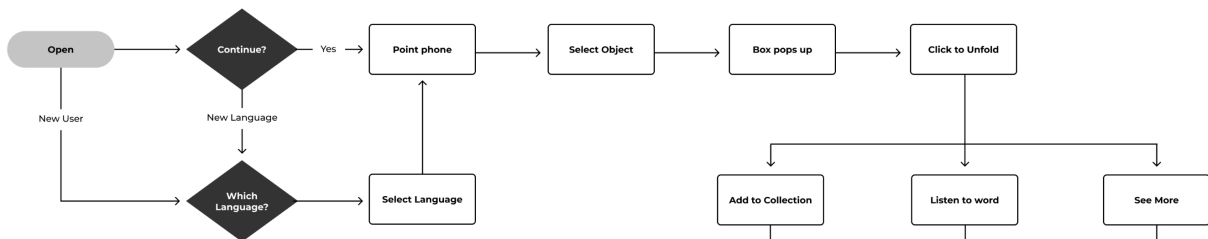


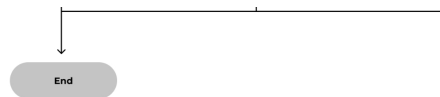


User Flows

Explore

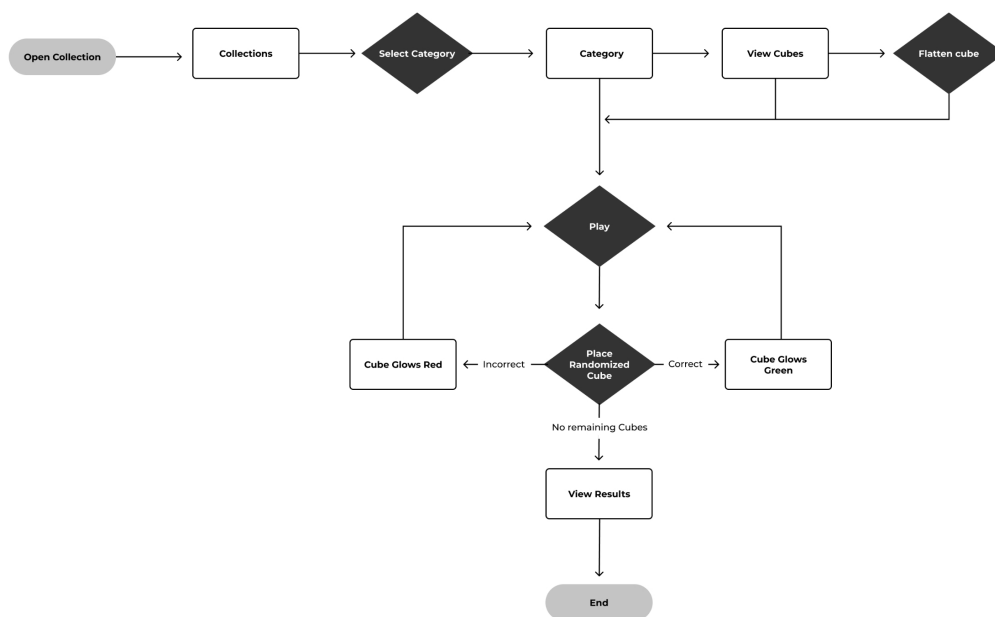
The user flow is as simple as point, click, and learn!





Collections + Play

Access your collections to view saved words, and play to solidify your chosen vocab.



Design Exploration

Cube Iterations

Deciding how to present the information within the space to the viewer was an important step in the process.

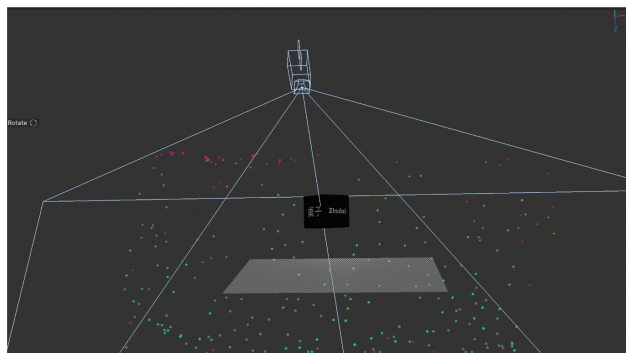
I initially started with cards, but eventually settled on a cube as the 3D nature would integrate better within the environment using mixed reality, and each side allowed for different pieces of information to be displayed, without being visually overwhelming.



Final Cube Design

Building the Cube

The cube was built and animated in Maxon Cinema 4D. All animations were tracked onto video footage to show how the user can interact with Cyri within their environment.



UI Iterations

The UI had to be simple and graphic, so that it would be legible when overlaid within mixed reality.

The only item on the final screen is the collections icon, keeping the interface intuitive and simple as to not take away from the immersive aspect of the experience.

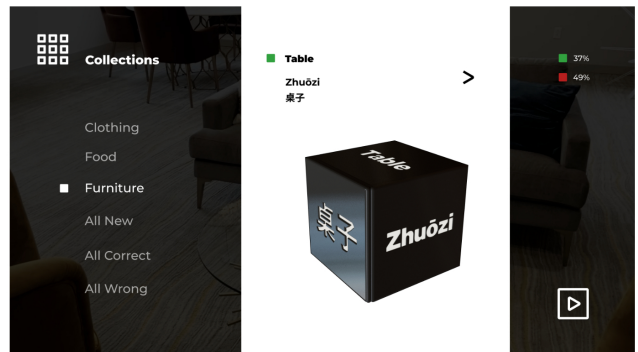
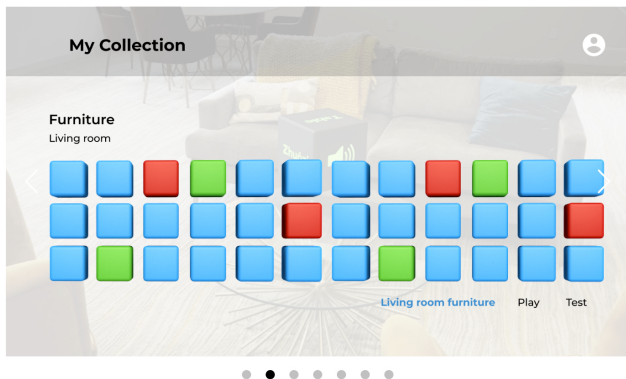


Final UI

Collections Iterations

The collections took some fine tuning to figure out what information was crucial, and what could be minimized to remove distractions.

3D Cubes that you have saved to collections are shown within each category, allowing for the user to scroll and see which they have gotten correct or incorrect. Total percentages are shown for the selected category as well.



Final Collections Screen

Visual Identity

Gyri

Why Gyri?

Gyri [jahy-rah-y] are the ridges and bumps you find on the brain, giving more surface area for better cognition in the small space. One of the important areas made up by Gyri is Wernicke's area, which is vital when it comes to language learning and comprehension.

Simple & bold

The limited color palette of **black and white** creates an easy to read, yet elevated look, allowing for immersion without distraction.

Green and red are used minimally to indicate if an answer is correct or incorrect.

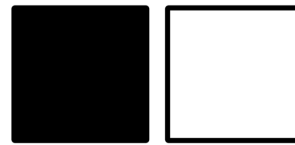
Blocky sans serif typefaces were chosen for ease of legibility, and also to allude to the cube's shape.



Montserrat Bold

Montserrat Semibold

Montserrat Regular



#000000

#FFFFFF



#33A03E

#B71F1F

Thanks for Looking!

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