CS 147 WINTER 2022

ACCESSIBLE DESIGN FOR DIFFERENT ABILITIES

Reimagining audio for everyone

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Project Name and Value Proposition

Project Name

ALTiO

Value Proposition

Reimagining audio for everyone

Problem and Solution Overview

Problem

Our goal is to make digital audio more accessible to the Deaf and hard of hearing communities.

Solution

Deaf and hard of hearing individuals often miss the nuanced information and emotion presented by audio, and feel left out of spaces where they are unable to have the same experience as their hearing peers. ALTiO requires users to supplement posts with drawings and artwork that conveys these more nuanced ideas in a visual way. Users can explore various ALTiOs by artist or genre to discover and engage with different visual content.

Needfinding Interviews

Methodology

When we started this project, we wanted to find ways to design accessibly for the Deaf and hard of hearing community, and to begin this process we connected with individuals who are members of or adjacent to the Deaf and Hard of Hearing communities. We interviewed four participants initially.

Our first participant was a premed college graduate who was born deaf, but now identifies as hard of hearing and uses two cochlear implants. Our second participant was an audiologist and mother who is also hard of hearing and uses two cochlear implants. Our third and fourth participants were a Deaf mother and hearing daughter (who identifies as a CODA - Child of a Deaf Adult).

Needfinding Interviews Cont.

Insights

Some key learnings that informed our later process were that captions often lacked in digital media, whether it be from lag or inaccuracy; that our third participant despite being Deaf enjoys and attends her children's choir concerts, and particularly appreciates interpretive signing for the lyrics; and that for Deaf and hard of hearing folks seeing and visual input is a huge part of the culture, for instance our second participant even said “Hearing is something that is difficult for me, visual is something that is easy”. This gap between sound and visuals was something that drove our design process.

POVs and Experience Prototypes

First POV

We met...
CJ, a Deaf mother and ASL professor who grew up in a predominantly deaf household.

We were surprised to notice...
CJ was saddened that some deaf children aren't exposed to sign language in their homes.

We wonder if this means...
A more important part of ASL education occurs at home and due to a community of ASL users.

It would be game changing to...
Connect disperse members of the deaf / HoH community to feel less isolated.

Second POV

We met...
Johnny, a hard of hearing college graduate who studied biology and grew up in a hearing household.

We were surprised to notice...
He prioritizes listening to and understanding the lyrics in a song.

We wonder if this means...
Lyrics are a way for Deaf/HoH people to participate in the pop culture phenomena of music.

It would be game changing to...
Integrate lyrics into the experience of music in a way that is engaging; find ways to make Deaf/HoH people feel included in pop culture.

POVs and Experience Prototypes Cont.

Third POV

We met...
Johnny, a hard of hearing college graduate who studied biology and grew up in a hearing household

We were surprised to notice...
He skips YouTube videos that do not have captions

We wonder if this means...
He feels left out when videos that he thinks might be engaging do not have captions

It would be game changing to...
Invite him into spaces of interest by ensuring clarity and understanding

POVs and Experience Prototypes Cont.

First POV HMWs

- How might we integrate the cultural significance of ASL into education?

- How might we create an immersive experience for people trying to learn ASL?

- How might we support connection between various hearing ability communities?

- How might we make Deaf events more widely known (especially for deaf children)?

- How might we support education for deaf children/hearing parents on ASL and/or the Deaf community?

Second POV HMWs

- How might we keep listening fatigue in mind when adapting predominantly listening technologies?

- How might we highlight musical intricacies without the proper auditory technology?

- How might we encourage smaller venues to support lesser represented people (HoH / Deaf community)?

- How might we support the visual experience of exploring alternate media?

- How might we incentivise the adoption of more accessible practices for the deaf / HoH community?

POVs and Experience Prototypes Cont.

Third POV HMWs

- How might we assist creators in ensuring their content supports the Deaf and HoH communities?

- How might we educate others about the Deaf community and accommodations needed?

- How might we make closed captioning more reliable and consistent?

- How might we improve the way that closed captions are delivered?

- How might we place the onus on the hearing person to make their content more accessible?

POVs and Experience Prototypes Cont.

In moving to creating solutions, our group settled on three main contenders.

Solution 1

The first solution was a hybrid environment that would connect people of all different hearing abilities in a space to socialize and communicate with one another in a way that subverts the challenge of long distance.

Solution 2

The second solution was a haptic feedback phone extension that provides a tactile experience for users based on audio input from phones.

Solution 3

The third solution was audio interpretation provided by hearing individuals in some alternative (most likely visual) form--whether that be text, drawing, etc of different media with audio attached.

POVs and Experience Prototypes Cont.

We developed three experience prototypes to test key assumptions to evaluate the validity of these ideas moving forward.

Experience Prototype 1

Prototype

To test our first solution, the hybrid communication environment, we wanted to make sure it was possible to follow a conversation visually on camera without audio input. To do this we had participants answer the question “what is a food you all dislike?” and reflect on the experience of following the conversation visually.

Results

From this prototype experience we learned that facilitating a visual based conversation is possible via video and learned some surprising things as well. Most notably our participants had a “easier time focusing” because no one could “talk over” anyone. And while participants didn’t expect to find an answer to the question they did. Unfortunately due to time restraints and scheduling conflicts, we were unable to test this with deaf / hard of hearing individuals which would warrant more study going forward.

Experience Prototype 2

Prototype

To test our second solution, integrating a tactile experience from audio information, we tested tactile feedback with members of the Deaf and hard of hearing community to see if it was worth exploring going forward. To do this, we had Deaf individuals use candy crush with and without its haptic feedback feature and asked their thoughts on the experience.

Results

Testing this prototype yielded some inconsistent results, which we hypothesize to be a matter of personal preference. Two of our participants (one was Deaf, one was hearing) really enjoyed the haptic feedback in the game and preferred it to the game without it–calling it “like fireworks”. One of our other participants on the other hand was distracted and stressed out by the feedback. This result yields need for further investigation, and could be included as a feature in another solution later on.

Experience Prototype 3

Prototype

And to test our final solution of individuals drawing interpretations of audio, we asked participants to take turns listening to and drawing their interpretation of “how an audio makes them feel” and then showing it to another participant who had not heard the song. The individuals viewing the interpretation then shared their thoughts on the drawings, and then had a short discussion with the artist about the work in a debrief.

Results

Of the three prototypes this was the most engaging for our participants. We learned that interviewees could in fact accurately extrapolate some kind of feeling from the drawings of others and participants enjoyed doing it. Participants did however express some stress and dissatisfaction with interpreting drawings without any information. This was a key insight we used to later refine the design in the prototyping phase.

Based on the excitement of participants with drawing and interpreting audio, and the ability of participants to glean information from drawings made by their peers, we decided to focus on the third solution.

Design Evolution

Our new app **ALTiO** serves to provide fun alternative audio interpretations for audio by connecting user-sourced creative expression to users in need of alternative audio. With a new, personal layer of shared interpretation, ALTiO enriches the user experience in an emotional and connective way: for one to create, and one to enjoy.

Tasks

Task 1 (simple): The user follows the prompts to create a post and add a drawing.

Since we are building a social media platform, this is one of the most important tasks as it allows users to generate content.

Task 2 (moderate): The user follows the prompts to name their ALTiO and add captions/explanation.

During our experience prototyping activities, we found that captions and explanations help other people to understand the meaning of the drawing.

Task 3 (complex): The user explores different content in the app, such as playing around with the profile page, hashtags, and posts in the feed.

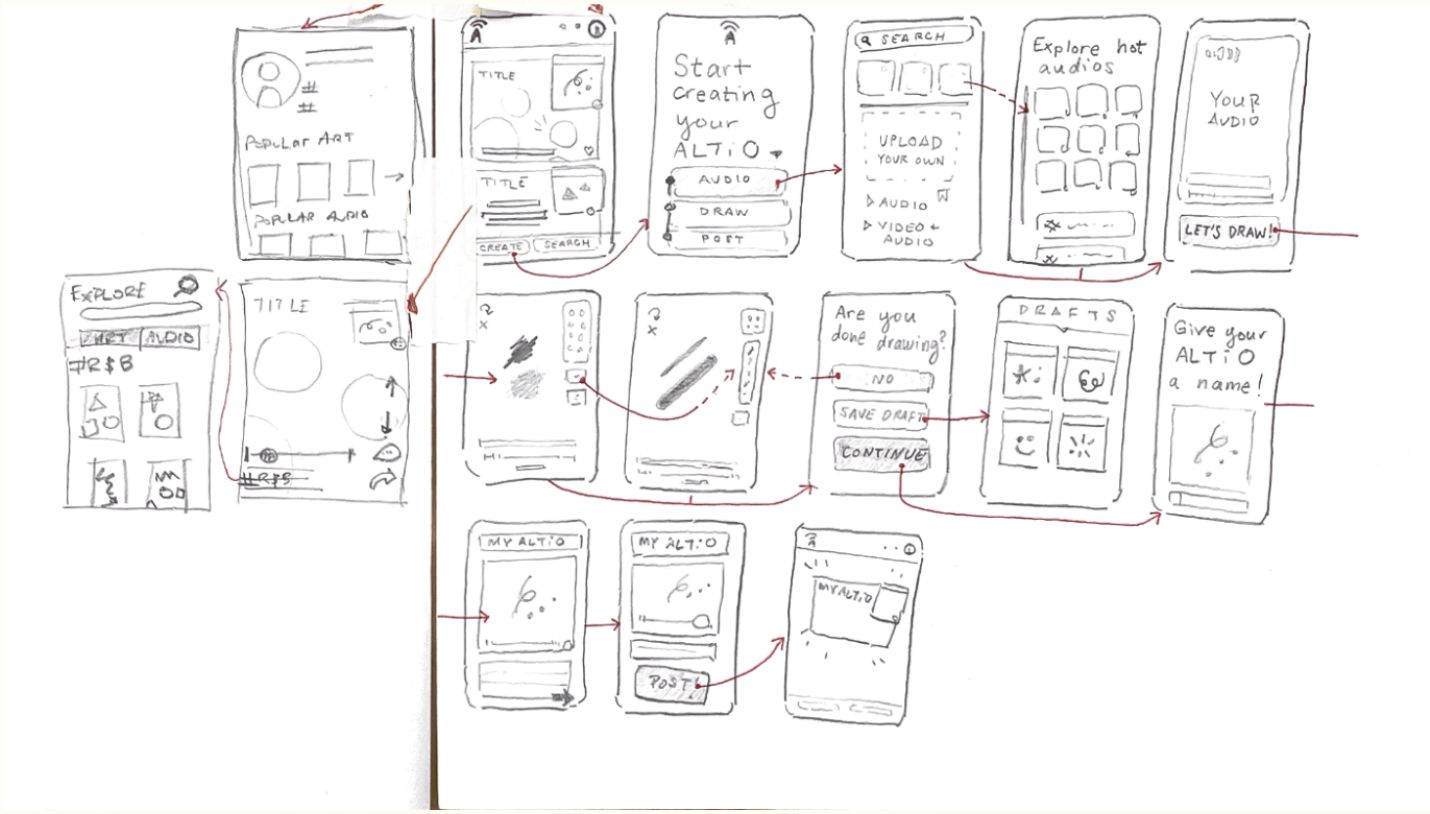
Our solution is to include Deaf and hard of hearing people in consuming social media content with audio by providing them with audio interpretations. We want to let users feel free to explore different content with ALTiOs in our app.

Design Evolution

Low-Fi Prototype

For low-fi prototypes, we started with sketches on paper to brainstorm possible user interfaces and screens for our solutions. Initially, we had two different ideas: an independent social media platform with drawing interpretations on each post, and an audio recognition app/plug-in. In deciding which prototype to pursue–the plug in versus the natvie app-we chose the latter because it **requires every post** to have a drawn interpretation. For the other plug in idea, it would operate like shazam where users can call up drawn interpretations for any audio they hear. The main issue with the shazam-like plug-in was that not all content could be guaranteed to have an interpretation due to the crowd sourced nature of the app. For these reasons we built the low-fi prototype of the native social media platform ALTiO using POP by Marvel.

Figure 1: initial design sketches for ALTiO



Design Evolution

Low-Fi Prototype Cont.

Figure 2: initial design sketches for audio recognition app idea

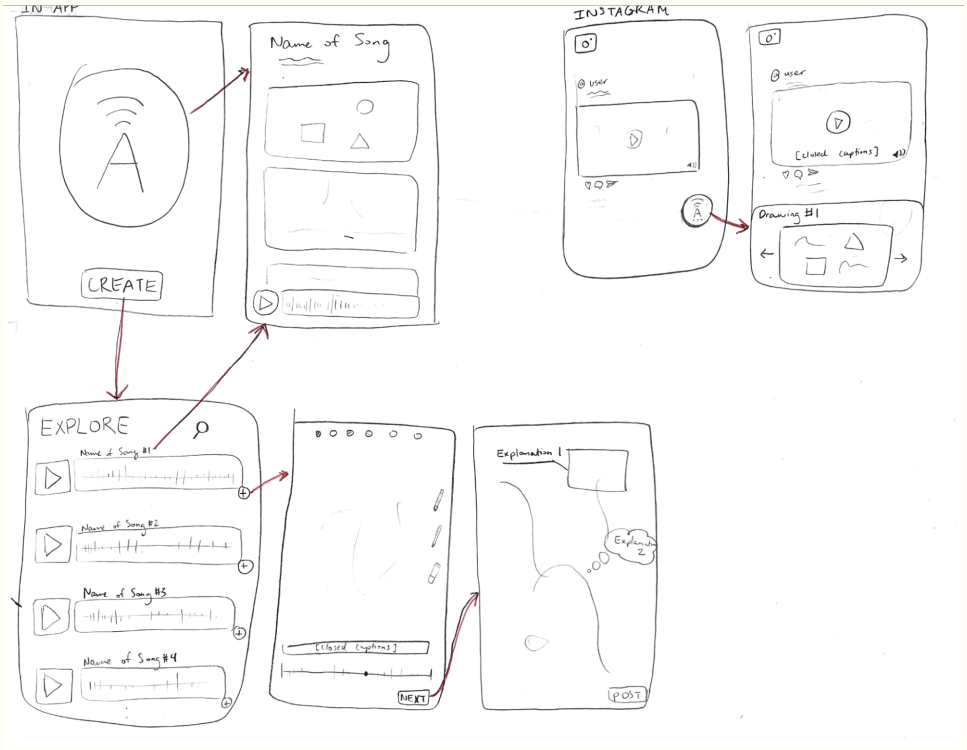


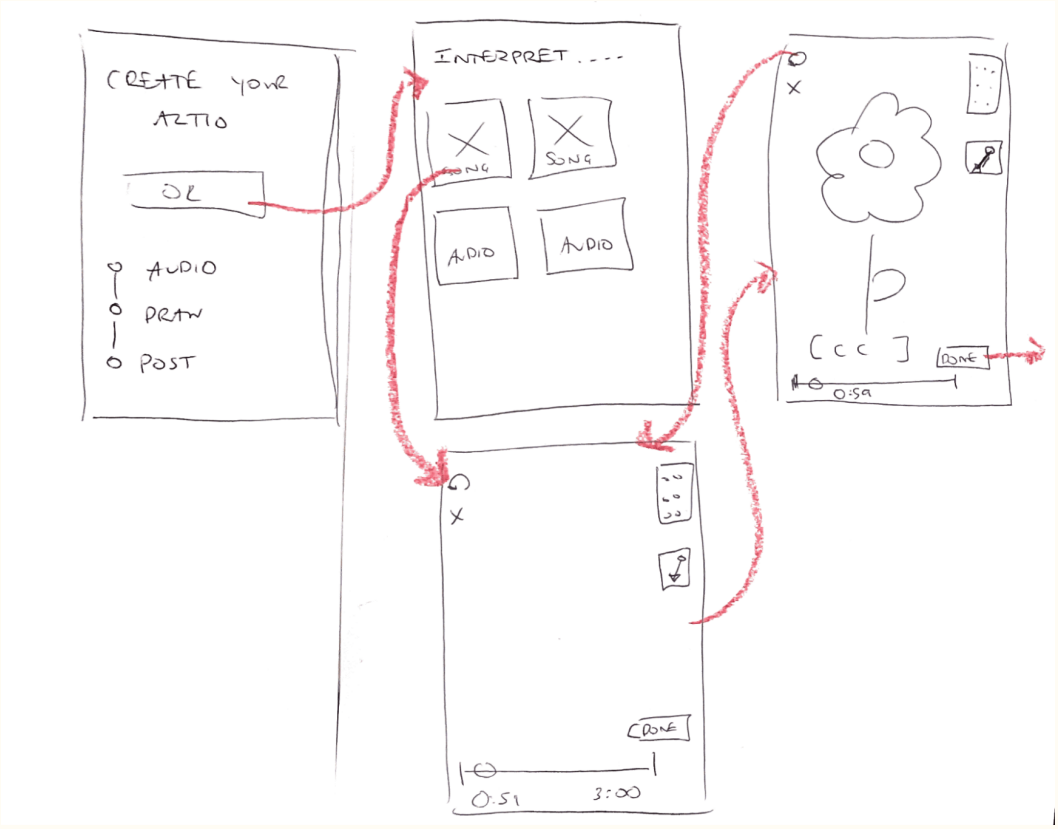
Figure 3: low-fi prototype built with sketches on paper and the Marvel App

Design Evolution

Low-Fi Prototype Cont.

During the process of building our low-fi prototype, we also came up with the three different user tasks for our app and made a task flow for each of them on paper. The user interface in the low-fi prototype sketches was rough, but surprisingly the core design concept has not changed much from our low-fi to final high-fi prototype.

Figure 4: Low-Fi prototype task flow for Task 1



Design Evolution

Low-Fi Prototype Cont.

Figure 5: Low-Fi prototype task flow for Task 2

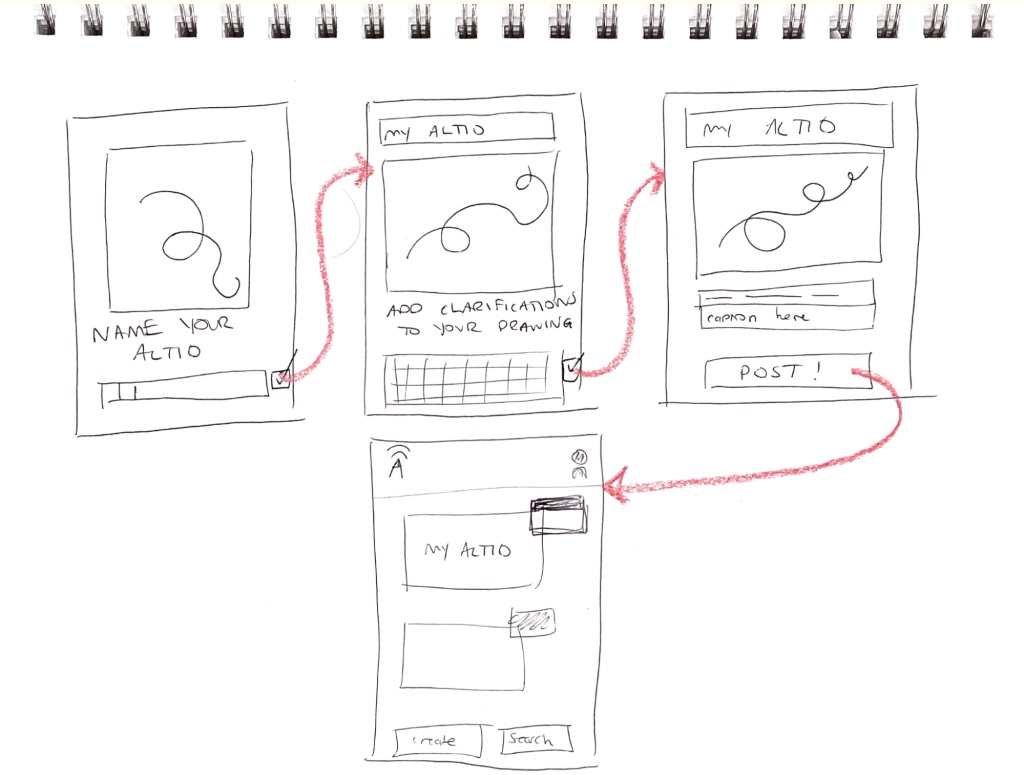
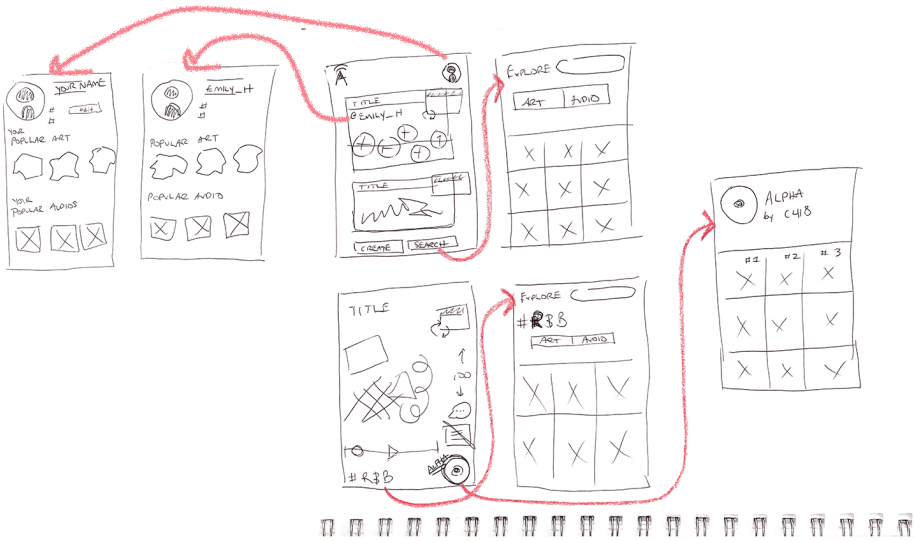


Figure 6: Low-fi prototype task flow for Task 3

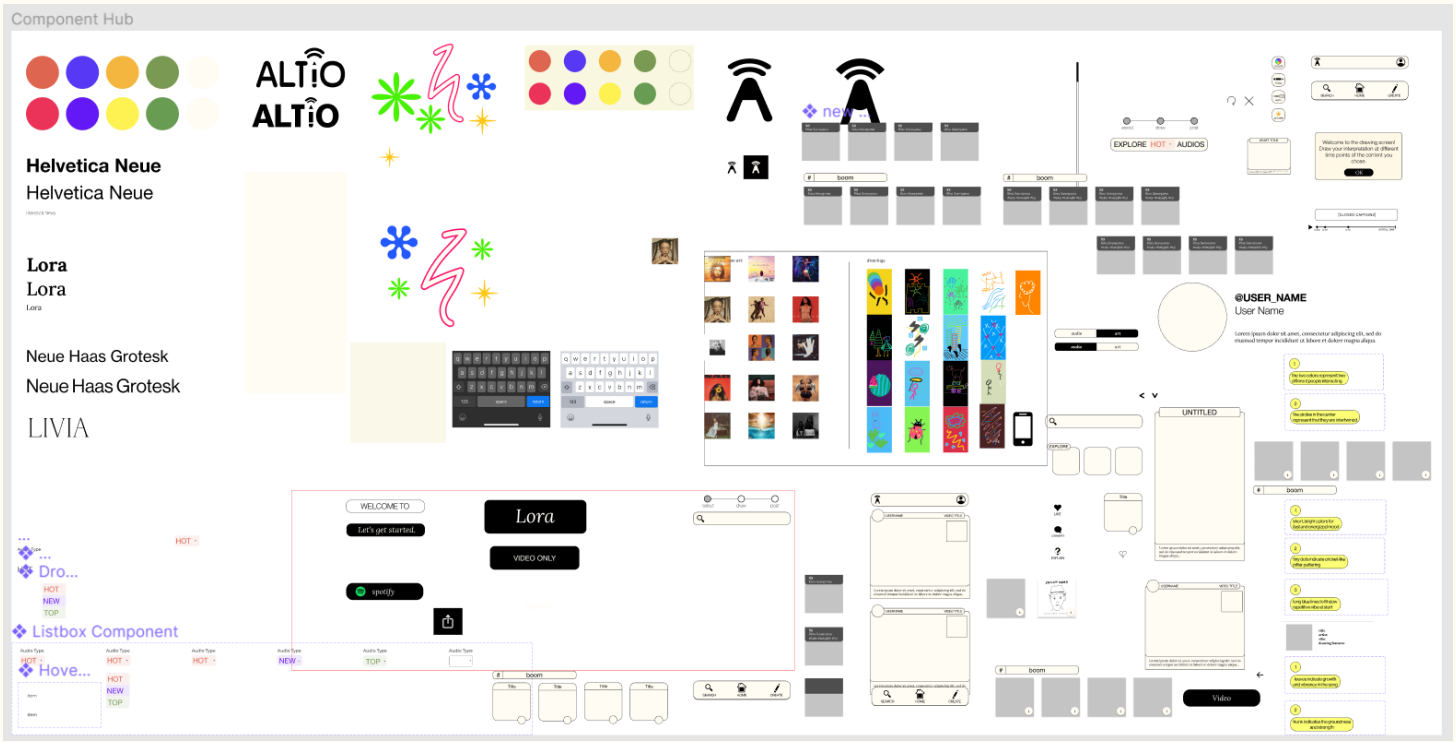


Design Evolution

Med-Fi Prototype

Moving from the low-fi prototype to the mid-fi prototype, we used Figma to build a user interface that looks more like a real app. During the building process, our designers created reusable components for faster, easier, and more consistent prototype building, including colors and fonts. The design of the app features a minimalist sketch-like background to highlight the sketching emphasis on the app, with colorful abstract embellishments to emphasize what an altio might look like.

Figure 7: reusable components for the building of the med-fi prototype

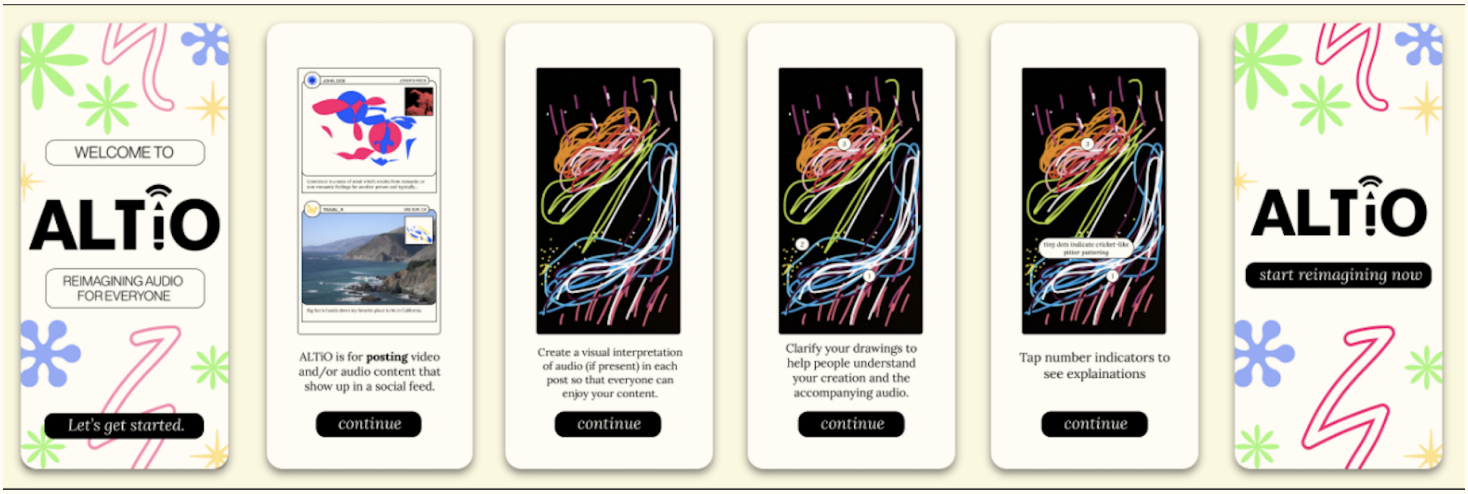


Design Evolution

Med-Fi Prototype

We also made several big changes from our low-fi prototype, many of which came from users' feedback and suggestions after interacting with the low-fi prototype. Major design change 1 was the addition of an on-boarding flow, which helps users better understand the purpose of the app and how to use it. This change was made because we found that the idea of an ALTiO can be quite confusing for people using the app for the first time, and understanding key features like clarifications and the goal of an ALTiO are essential to the app's function.

Figure 8: Major Design Change 1 - Onboarding Flow

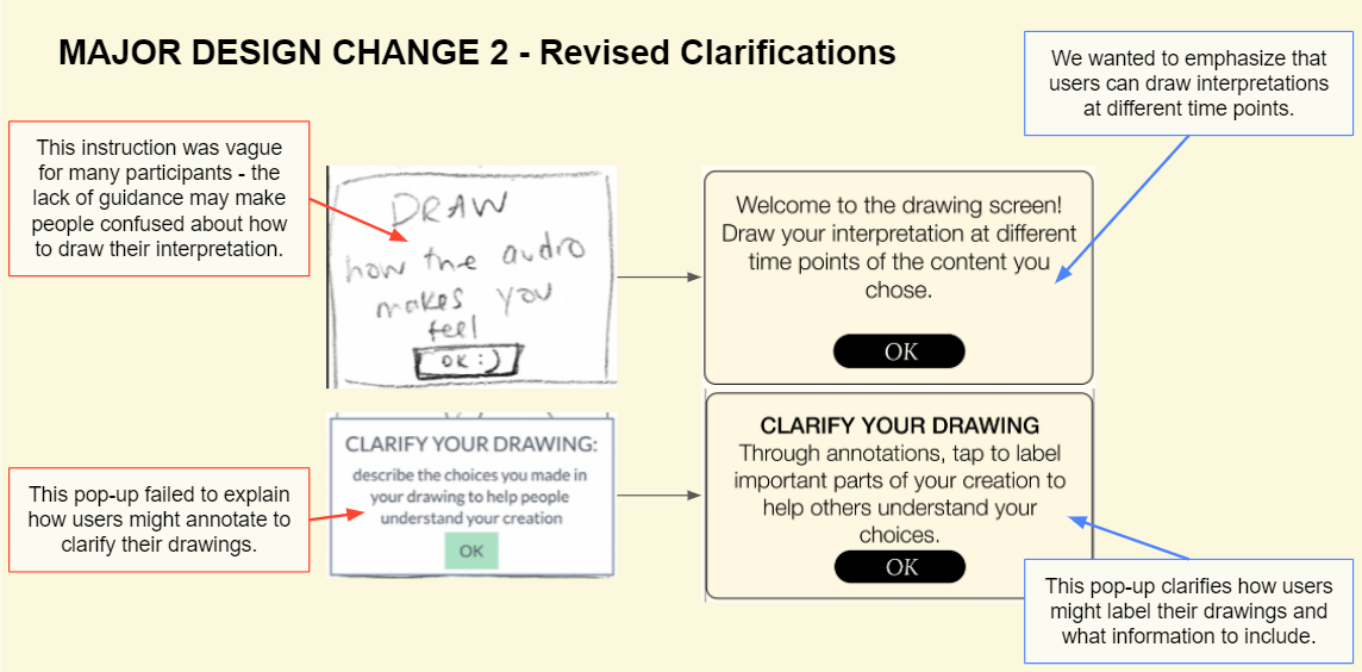


Design Evolution

Med-Fi Prototype

Major design change 2 was revised clarifications. During low-fi prototype testing, some participants found it difficult to follow the instructions, so we revised the clarification wording to make it easier to understand.

Figure 9: Major Design Change 2 - Revised Clarifications

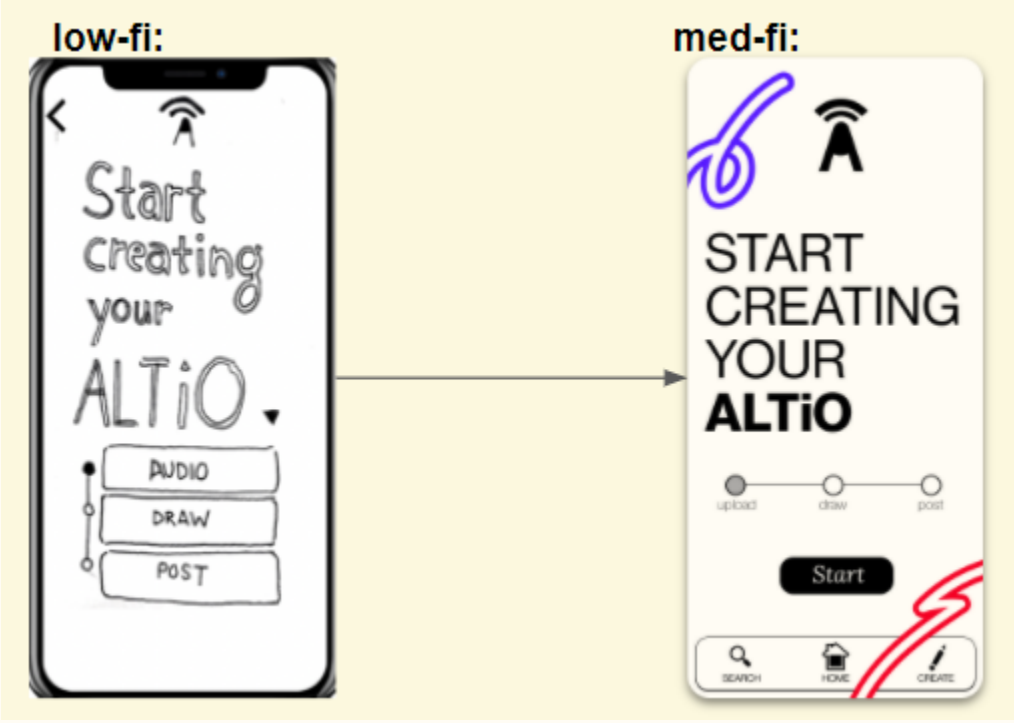


Design Evolution

Med-Fi Prototype

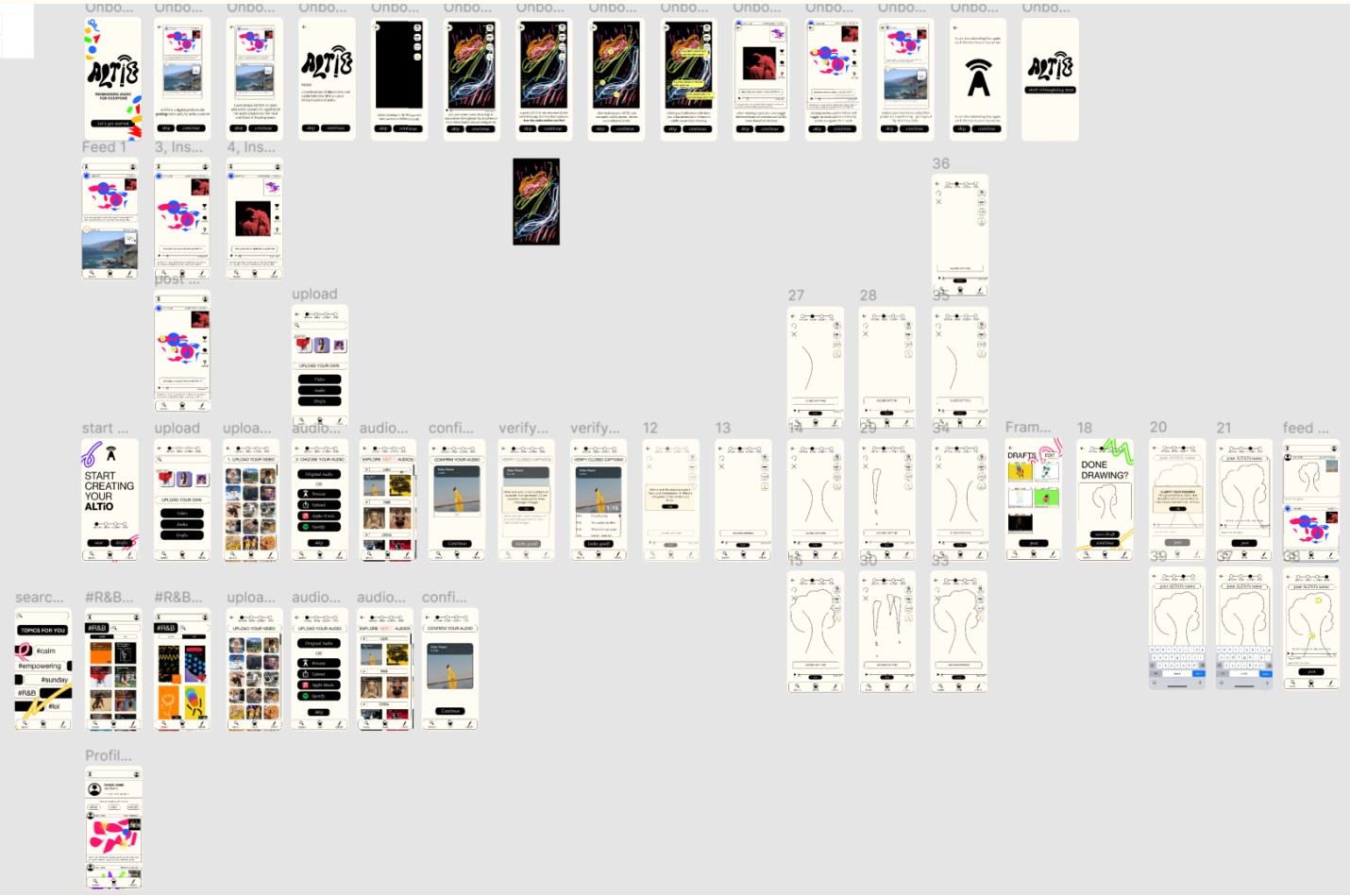
Major design change 3 was the design of the starting creation screen. In the low-fi prototype, we wanted to show a progress bar for the users to have a better idea about which stage they will go through in the following creation process. However, the design of the progress bar was a little confusing and misleading. Some people thought the second or the third stages were clickable buttons. As a result, we redesigned the progress bar to make them look less like buttons, and added a “START” button for people to easily navigate through the screen.

Figure 10: Major Design Change 3 - Starting Creation Screen



Design Evolution

Figure 11: Full Med-Fi Prototype



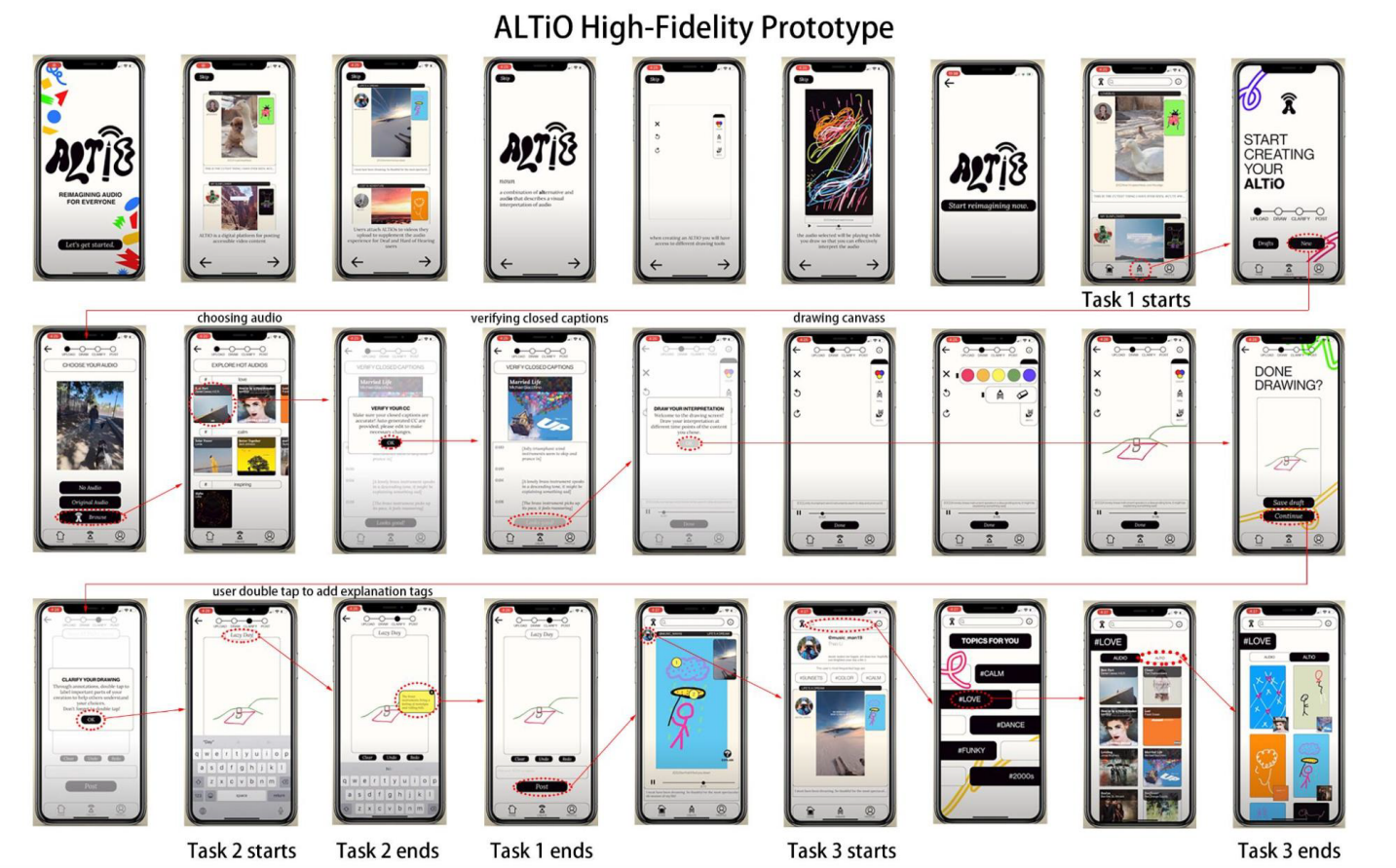
High-Fi Prototype

For the high-fi prototype, we built the app under the React Native framework in Expo. During app development, we also made some small modifications, such as the position, size, or color of buttons, icons, etc. Details are discussed in the heuristics section. The figure below shows our high-fi prototype with some annotations of how each of the three tasks are being done.

Design Evolution

High-Fi Prototype

Figure 12: High-Fi prototype with 3 task flows

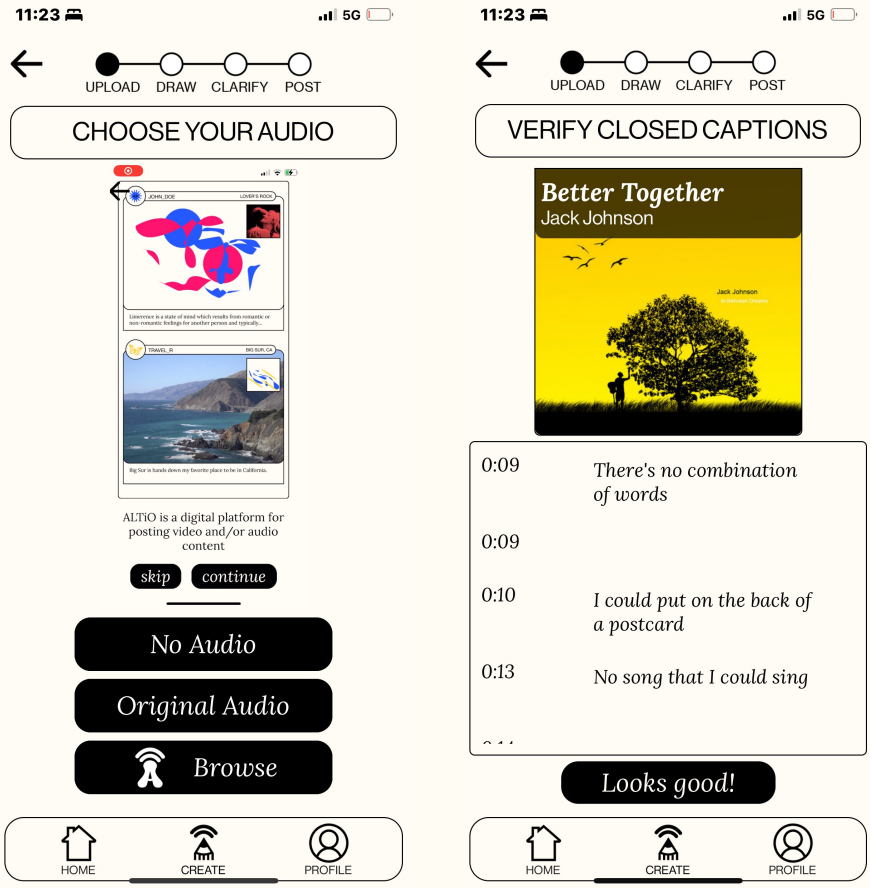


Design Evolution

Heuristic Violations

H1: visibility of system status / Severity: 3 : There is no change in content when the user toggles between the “hot,” “new,” and “top” audio categories.
We ended up removing this toggle feature due to unnecessary content for the app as we already had many audios to choose from

H3: User Control and Freedom / Severity: 3: Multiple screens are missing back buttons.



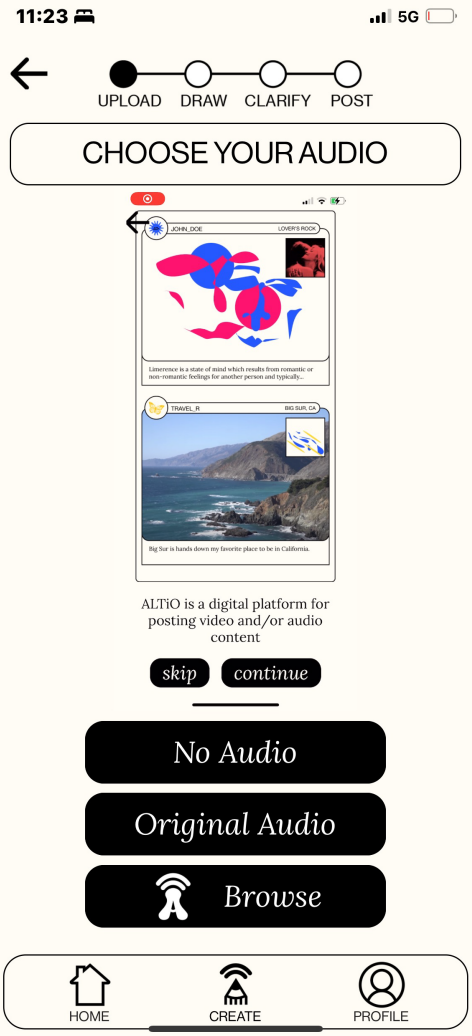
To address this we added back buttons to all relevant screens in the top left due to convention.

Design Evolution

Heuristic Violations

H3: User Control and Freedom / Severity: 4: In the “create” flow, users can select a video and choose an audio to accompany it. However, if users select an audio first, there is no prompt to select a video to accompany it.

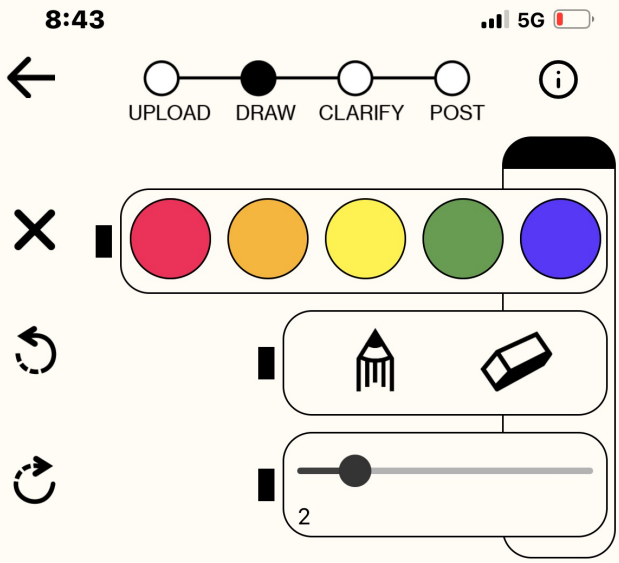
To address this issue, our team had a conversation about the ability to post content without video and decided in the end to remove the option to include audio only (later would be accompanied by an ALTiO). This was to make sure that Deaf and hard of hearing people were centered in the app, and we wanted to make sure all content was engaging for our intended audience.

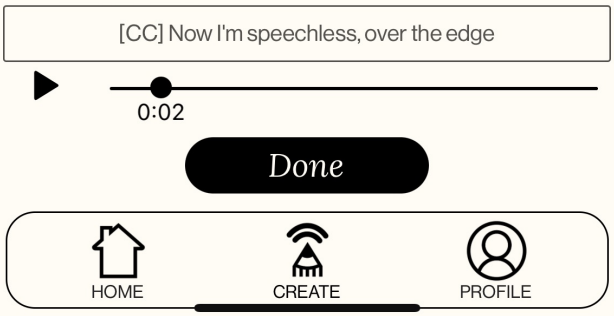


Design Evolution

Heuristic Violations

H3: User Control and Freedom / Severity: 3: Problem: There is no “redo” button when the user is drawing.
Redo, undo and clear buttons were added to the draw screen for standardization



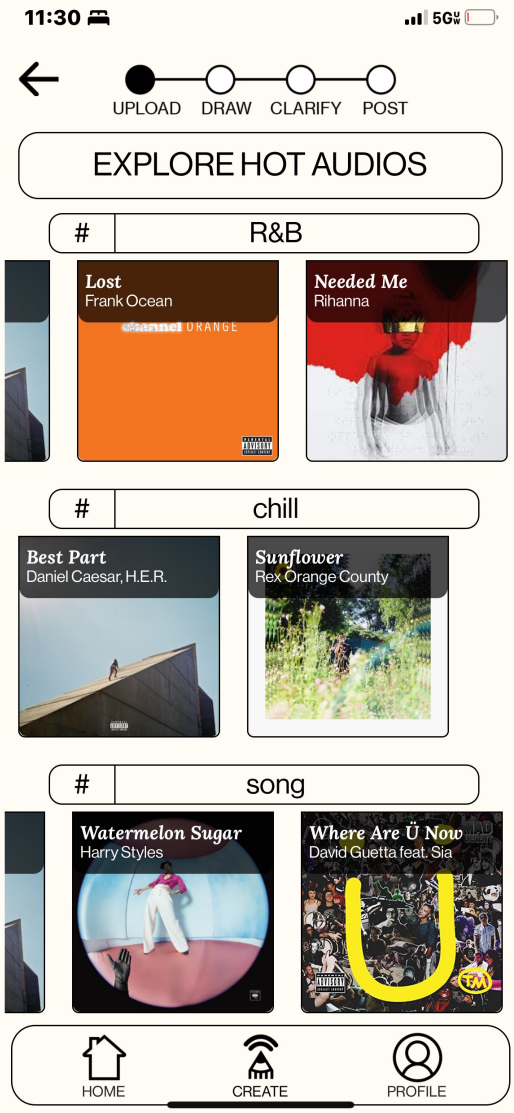


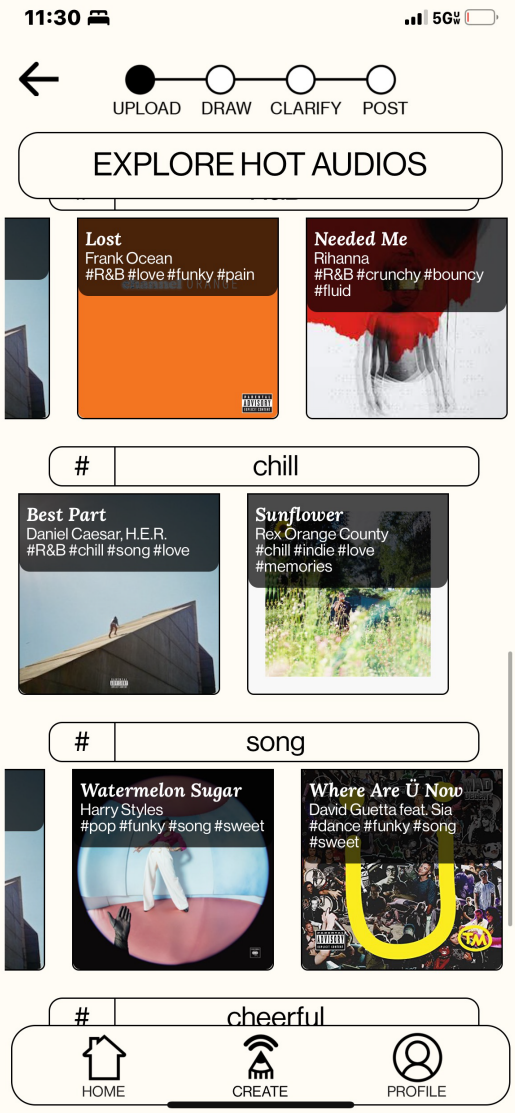
Design Evolution

Heuristic Violations

H4: Consistency and Standards / Severity: 4: only album selection, no song selection for audios

Expandable title and hashtag menus on each song are toggled for additional information on songs. This helps users to see exactly which audio they are selecting



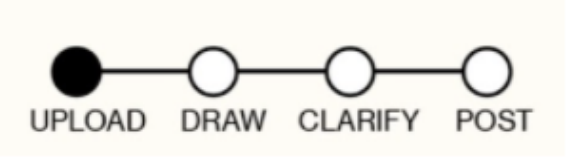


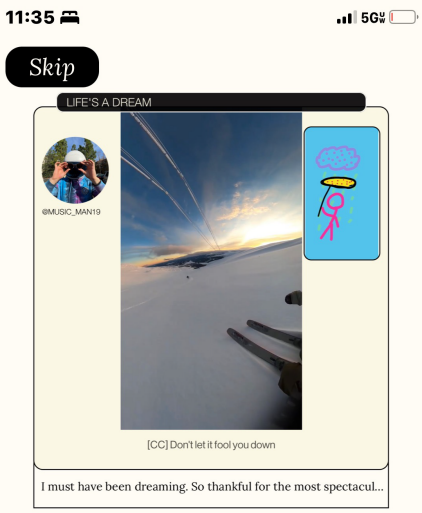
Design Evolution

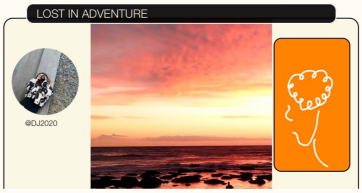
Heuristic Violations

H4: Consistency and standards / Severity: 3: confusion on being told to draw my ALTiO at different time points
We standardized the drawing process by only including one drawing per audio to make the experience more palatable for new users

H6: Recognition not Recall / Severity: 3 During the “create” task flow, the status or stage only includes “select” “draw” and “post” when there are multiple substages within “select” including selecting video content, audio and captions.
A redesigned create bar and post flow optimizes for both conciseness and clarity in the process. There are less screens in the new upload sequence to help with this







Users attach ALTiOs to videos they upload to supplement the audio experience for Deaf and Hard of Hearing users

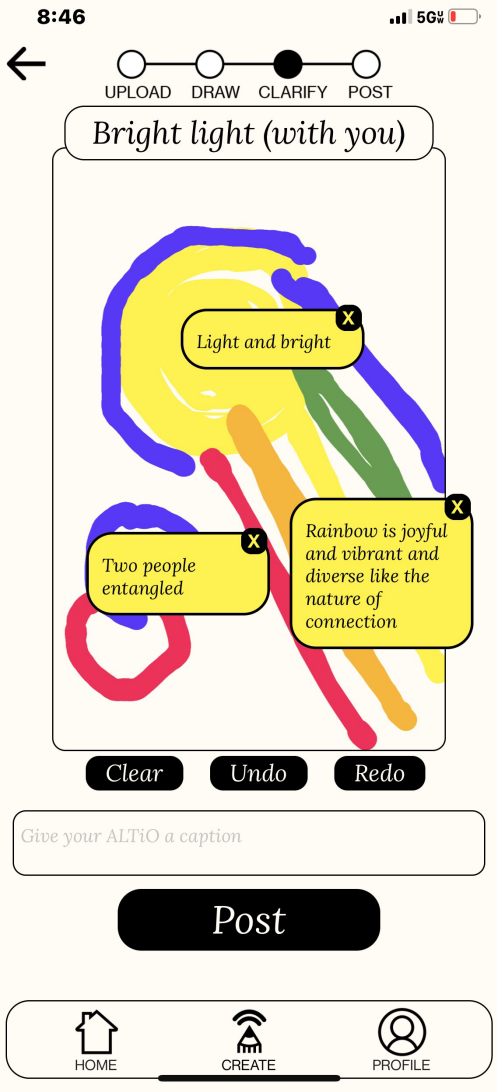
H13: Value alignment / Severity: 4: specifically mention Deaf/HoH in this intro, as a rationale for using the app in the first place
In our onboarding flow, we make a point to specifically mention the goal of ALTiO and the centering of the Deaf and hard of hearing communities in our work.

Design Evolution

Values in Design

Our values that we centered around are inclusivity, creativity, personal expression, and community.

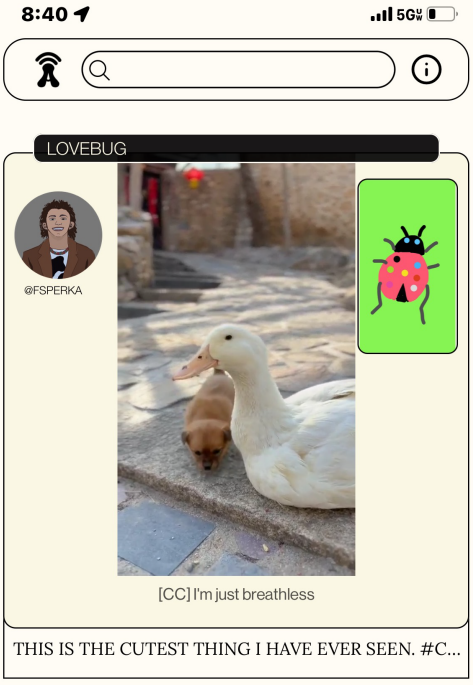
Inclusivity comes not only through our fundamental goal of the app to include Deaf and hard of hearing individuals in more online content, but also through our use of clarifications. These provide low vision users an opportunity for ALTiO clarifications to be read using a screen reader. This also helps clarify personal expression for users, allowing for additional space to clarify their designs.

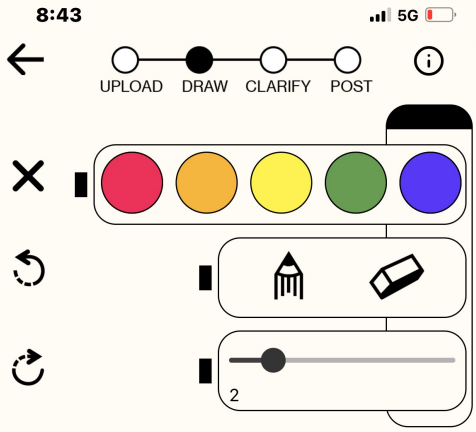


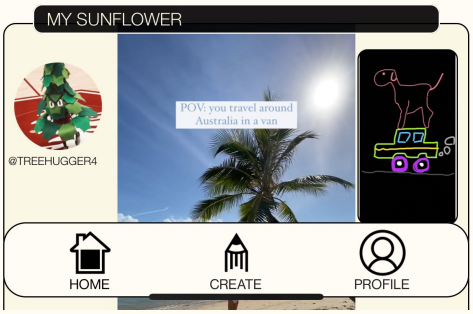
Design Evolution

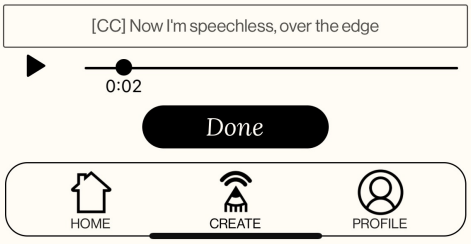
Values in Design cont.

In terms of creativity, users are provided a platform that emphasizes their content. In the feed and drawing screens, our visual design is intentionally more barebones in order to highlight the art and content created by users rather than the structural UI of the app. We also provide different customizations for users in the creation process to facilitate their creativity.





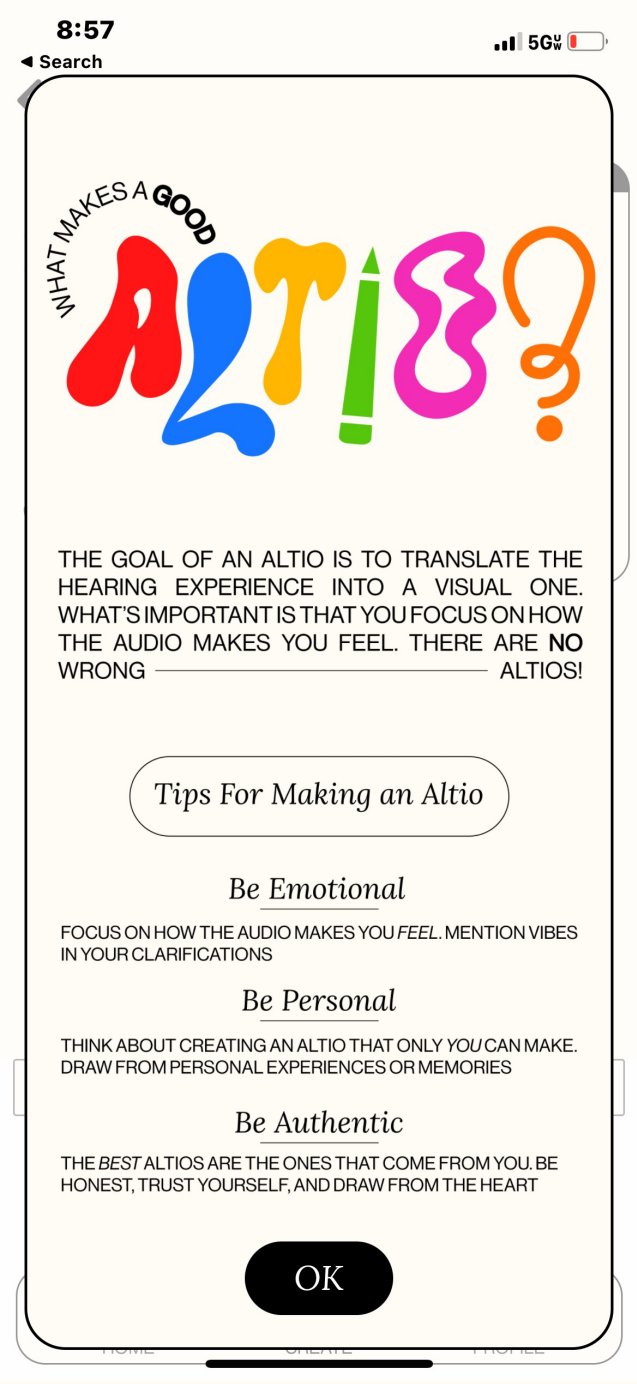




Design Evolution

Values in Design cont.

To some extent, personal expression and inclusivity may conflict. For instance, a more abstract or personal interpretation may exclude certain people in understanding the audio to their benefit. To address this, we included some drawing guidelines that assist creators in creating their drawings.



Design Evolution

Values in Design cont.

Our final prototype had a lot of features, so it required a lot of work and love!

Tools:
All plans for our new screens were updated in Figma based on our heuristic evaluation feedback. To redesign the icons and graphics to look more unique and fit the vibe of our app, we used the Adobe suite.

For building the actual mobile app, we used the Expo platform to run our app written in Javascript using the React Native framework. React Native allowed us to take advantage of the many libraries out there to not have to build certain components from scratch, and Expo allowed us to run our app on our phones and simulator with ease. We used Firebase to host our backend, and Github for source control.

Overall, there were not too many limitations with these tools beyond what we were technically unable to do in the span of two weeks. For example, originally we wanted to allow an option for users to connect to their Spotify and include songs from there, but decided to not include this feature in this prototype as there was no easy way to get lyrics of songs for closed captioning. A different limitation was that certain libraries written in native code were not compatible with Expo, so we had to **find or make components, which was somewhat time consuming.**

Wizard of Oz Techniques:
There are not too many Wizard of Oz techniques in this prototype, as most of the app is functioning. The main one would be that in the screen to verify/edit closed captions, the captions do not actually get edited. Additionally, continuing a post from drafts places an overlay of the draft over the canvas, but does not persist in the rest of the posting process (only the strokes that are added will show up).

Hardcoded Data:
As our app depends on user generated content, all of the posts that show up in the user feed and all of the user profiles are hardcoded. For each post, hardcoded data include the video, audio, captions, drawing, explanations, title, post caption, and profile associated with the post. For each profile, the user handle, name, bio, profile picture, and frequented hashtags are all hardcoded. In the posting process, all of the audio that is available and the captions and hashtags accompanying each audio clip are hardcoded. Lastly, the drafts screen includes hardcoded sample drafts, and the search screen's "Topics for you" page is hardcoded.

This project taught us that design requires a lot of time, dedication, and focus to be done well. There were so many different paths and options to explore, and due to the speed and quantity of work we had to do, this required a lot of discussion and prioritizing of where to spend more and less time. Knowing when to move on is a challenging part of design. Focusing on group culture, the collaboration, and appealing to everyone's strengths helped to divide work well and produce amazing results. Needfinding helped us immensely in understanding a problem area that we did not previously have much experience with. Listening to and engaging with individuals in the problem space taught us so much about the Deaf and hard of hearing community, accessibility, and humanity at large. A huge takeaway was how much we don't think about when we aren't a member of a community. People seldom think about how the visibility of their mouth helps others understand them, or what it might feel like to be avoided and feared for using sign language. Awareness is a huge step in accessibility in general, and it is challenging to raise when those who need it most are completely unaware of the need.

As we look forward to what comes next, we still have much to explore. Most of our group will be continuing with this project next quarter, and we have lots of ideas. We would still like to explore ways to facilitate alternative caption generation for music both with and without words–particularly focusing on how to make captions for non-vocal audio useful and meaningful to users. We would also like to continue exploring ways to facilitate a fun and rewarding drawing experience for creators through guiding prompts and suggestions. And most importantly, we are interested in showing our designs to members of the Deaf and hard of hearing communities to hear their feedback. What parts are enjoyable and beneficial to the Deaf / HoH experience? What parts could use some more attention and centering the community? We are excited to fully flesh out the development and design of these elements in the next course where we will continue this project.