arbor

Grow your good times.

Final Report

CS147 Autumn 2023
Preserving the Past

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Table of Contents

Value Proposition

Grow your good times.

Team Members and Roles

Melody F. - User Researcher and UX Designer
Blaine W. - User Researcher, UX Designer, and Mobile Developer
Dante D. - User Researcher, UX Designer, and Web Developer
Hamidou G. - User Researcher and Mobile Developer

Problem/Solution Overview

Problem: In our needfinding, we observed that people do not have an efficient and dedicated method to recall past positive memories.

Solution: With Arbor, we hope to provide just that: a garden of memories as rich as your own life experiences, that prompts you to engage with your past in a healthy and regular fashion. This solution takes the form of a virtual tamagotchi-style garden where you can plant and revisit good memories in the form of trees.

Needfinding

Interviews

Our design process began with selecting a diverse slate of seven participants to interview:
- **Michael**, a Professor of Classics at Stanford, with experience in curating physical and digital archives of past cultures and skill sets.
- **Nancy**, an academic with a PhD in Japanese literature and extensive experience in Japanese tea practices, language, and poetry.
- **Audrey**, a junior and Mexican immigrant studying CS at Northwestern University in Chicago.
- **Joe**, a father of five and native of the Bay Area, who owns businesses in

construction and medical sterilization.
- **David**, a Stanford Professor and founder of the Stanford d.school.
- **Taylor**, a data science major and dancer from Columbia, South Carolina.
- **Stephen**, a slack-key guitarist and director of Choral Studies at Stanford University.

Representing a wide variety of ages (20-67), genders, races, skill sets, and education levels, these seven participants provided invaluable insights into what it means to preserve the past—and what challenges this domain presents. The volunteers were found through a range of different methods, from cold emails to word of mouth to driving around and looking for willing participants in public areas. After consenting to an interview, several team members would sit with the interviewee for about an hour, asking questions related to what it means to preserve one's own past, and create a lasting legacy.

Synthesis

After speaking with each participant we synthesized multiple empathy maps, from which we drew key needs and findings to focus on in the next step of our design process. The empathy maps contained a plethora of internal notes on what the interviewee said or did, as well as inferences of what they thought or felt.
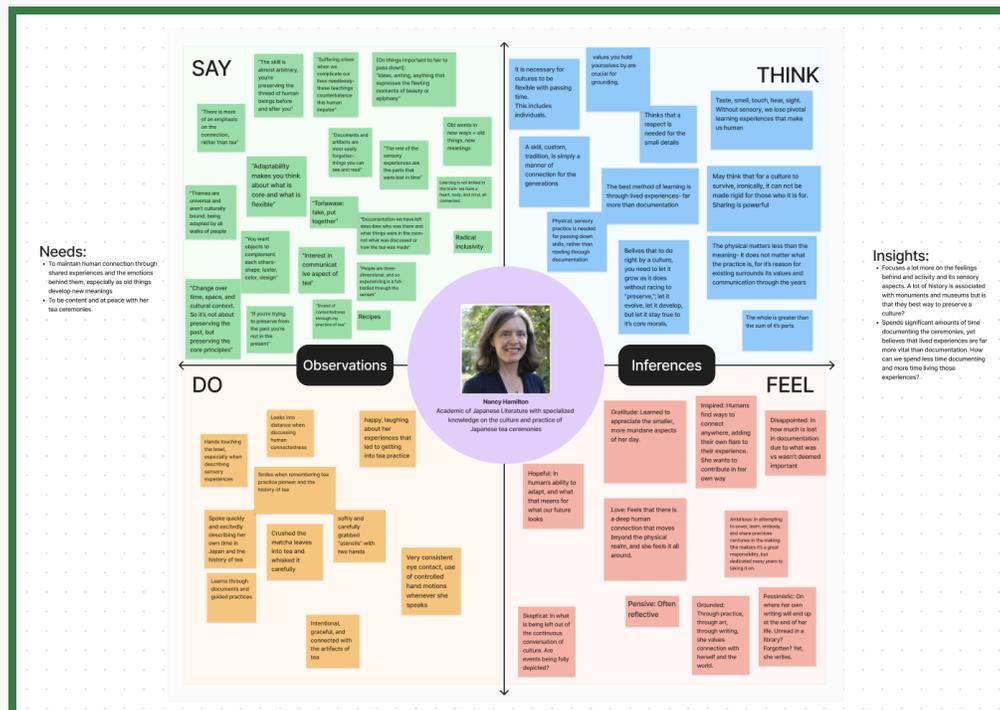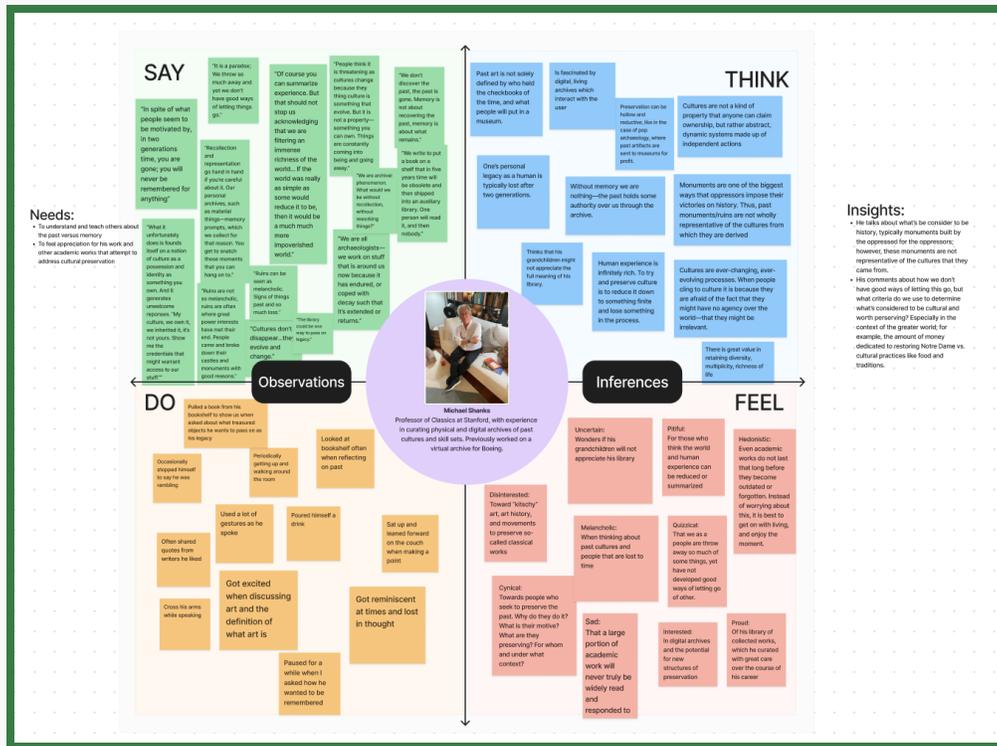
Figure 1. *Empathy Maps for Nancy and Michael*

This process helped uncover and highlight some of the more poignant thoughts shared with us by our interviewees. For instance, Michael commented that "In spite of what people seem to be motivated by, in two generations time, you are gone; you will never be remembered for anything." This statement, coming from an academic who's domain centers around long lost cultures, was particularly shocking to hear. Furthermore, Audrey also broke our expectations, stating that she, "only think[s] of the past when something goes wrong in [her] life." Given that most of our interviewees looked on the past as something worth preserving and holding on to, it was fascinating to hear a radically different perspective of how the past could preserve itself in negative ways as well.

In addition to what we observed and recorded, we also noted inferences about what our interviewees were thinking and feeling at the time of the interview. For instance, we noted that engaging in tea ceremonies and other ancient practices gives Nancy the strong feeling of connecting to other humans and their experiences. From here, we built off of observations and inferences to craft insights about our interviewees and their experiences, leading us to the next stage of the design process.

POVs

Overview

We developed point of views (POVs) for three of our interviewees who's perspective we wanted to explore more based on diversity of thought and interest.

We then developed 10-15 "How Might We's" from each POV to create direction for future solution brainstorming. Each HMW was done very quickly with an initial focus on quantity rather than quality to gather as many ideas as possible, using constraints like "if we could use magic…" or "if we had unlimited money…" to bolster creativity.

From the 40+ HMWs developed, we chose 3 HMWs for each POV narrowed down based on group interest/feasibility/and scope within our section.
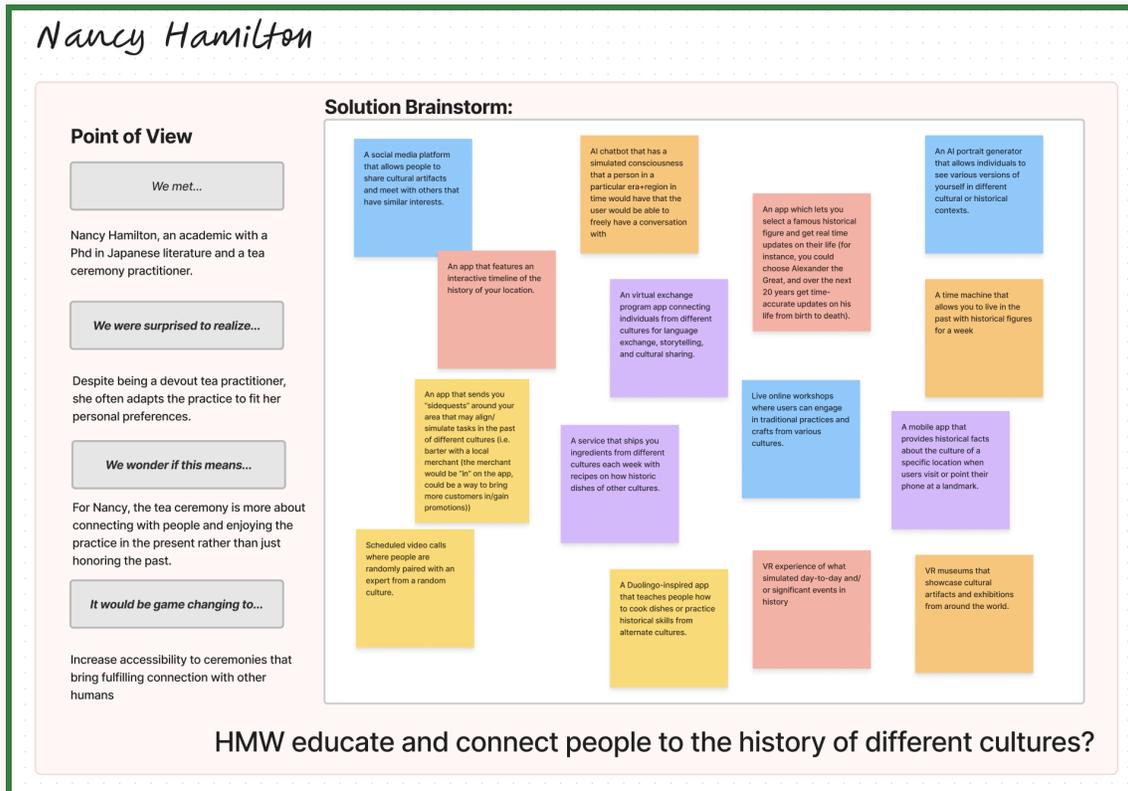
Nancy Hamilton

Figure 2. Solution brainstorm for Nancy.

We met... Nancy Hamilton, an academic with a PhD in Japanese literature and a tea ceremony practitioner.

We were surprised to realize that despite being a devout tea ceremony practitioner, she often adapts the practice to fit her personal preferences.

We wonder if this means... that, for Nancy, the tea ceremony is more about connecting with people and enjoying the practice in the present rather than simply honoring the past.

It would be game-changing to... increase accessibility to ceremonies that bring fulfilling connections with other humans.

<div align="center">

How Might We...
educate and connect people to the history of different cultures?
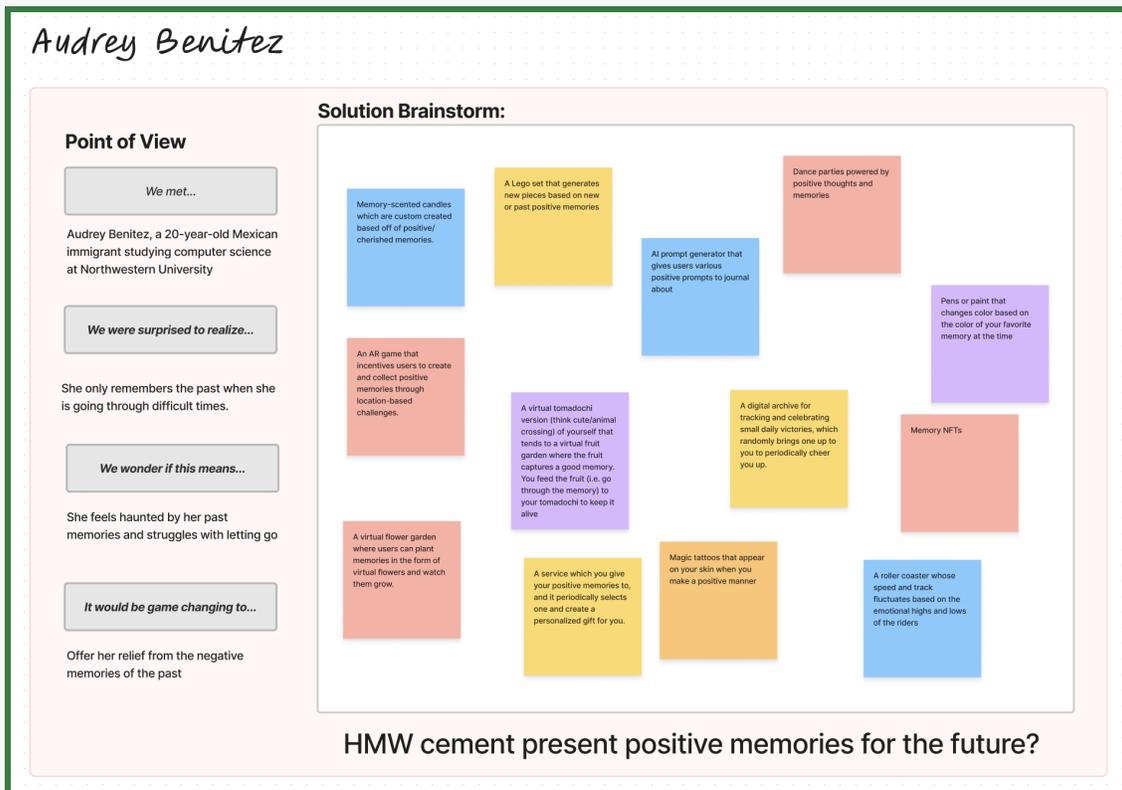
</div>

Audrey Benitez

Figure 3. *Solution brainstorm for Audrey.*

We met... Audrey Benitez, a 20-year-old Mexican immigrant studying computer science at Northwestern University.

We were surprised to realize that she only remembers the past when she is going through difficult times.

We wonder if this means... that she feels haunted by her past memories and struggles with letting go.

It would be game-changing to... offer her relief from the negative memories of the past.

How Might We...
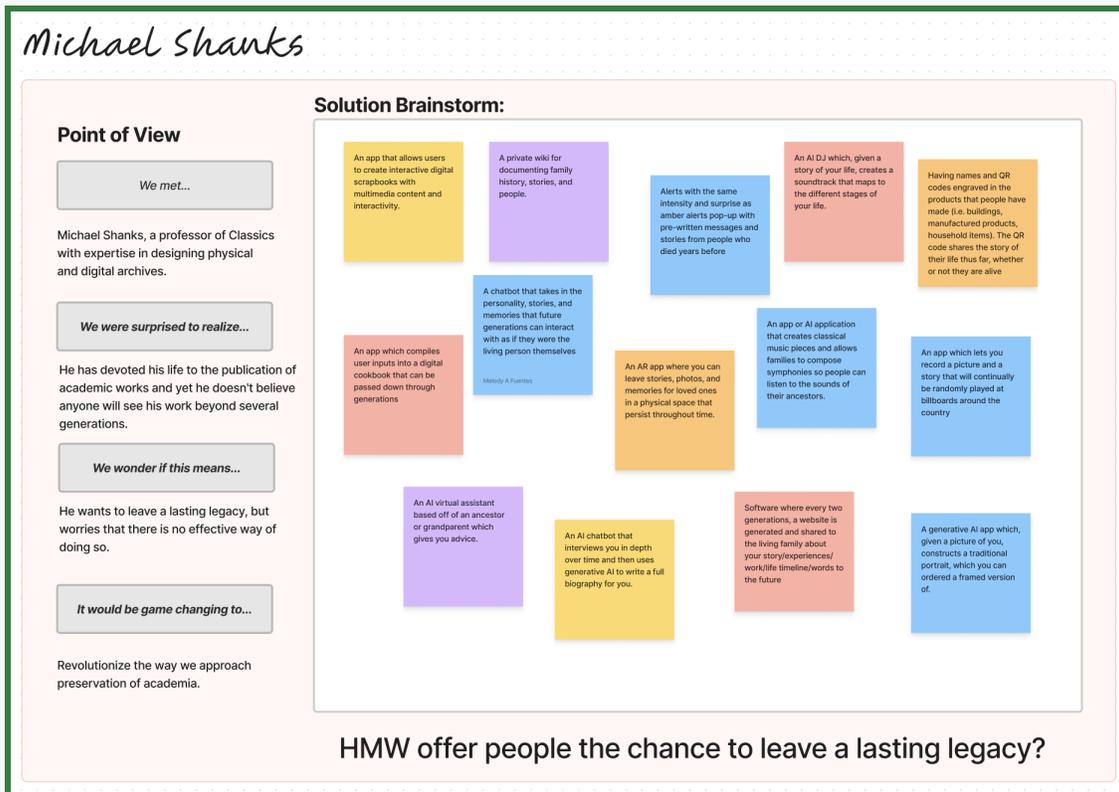presently cement positive memories for the future?

Michael Shanks

Figure 4. Solution Brainstorm for Michael.

We met... Michael Shanks, a professor of Classics with expertise in designing physical

and digital archives.

We were surprised to realize that he has devoted his life to the publication of academic works and yet he doesn't believe anyone will see his work beyond several generations.

We wonder if this means... he wants to leave a lasting legacy, but worries that there is not effective way of doing so.

It would be game-changing to... revolutionize the way we approach preservation.

How Might We...
offer the chance to leave a lasting legacy?

A solution for each selection was created to address the most promising HMWs. Each solution had a critical assumption we needed to test to make sure the idea holds up in practice. Thus, we identified these assumptions for each prototype, and created an experience prototype to test each assumption.

Top Three Solutions: Historical Skills (No. 1)
An app that teaches people how to incrementally practice historical skills (i.e. cooking, weaving, etc.) from alternate cultures.

Key Assumption:
People are interested in cultures different from their own heritage.

Prototype:
The participant was presented with 6 various cultural skills on flashcards. The cultural skills were made to vary widely by nationality/region, and the skills were chosen based on that culture's traditions. From these 6 skills presented, the participant must eliminate options until they arrive at a skill they would like to learn.

Synthesizing Results:

What worked:	What didn't work:
Interested enough to use their phone to conduct further research on the	Uninterested in activities that participant perceived as high effort or

options available. Despite unfamiliarity with all activities, was not deterred by a lack of knowledge. Enjoyed interacting with varied activities.	differing from her aesthetic. Without knowing what a skill might be just by the name, the participant was hesitant to pick it.
Key Learnings and Implications:	
Our assumption proved true as our participant was drawn to cultures that were different to their native culture. Coming from an Asian background, they chose a skill from Northern Africa that they were interested in learning more about, despite having no previous knowledge of.	

Top Three Solutions: Virtual Garden (No. 2)

A virtual "tomodachi" of yourself that tends to a virtual garden. You record positive memories in this garden, which are planted as trees. When the trees bear fruit, you are reminded of the positive memories, and the tomodachi eats them to grow.

Key Assumption:
Writing and periodically reviewing what you aim to remember will help reinforcing it in your head.

Prototype:
The tester presented 12 words written on 12 different sheets of paper. The words were chosen at random, and were made to vary as much as possible (nouns, verbs, adjectives) using an online generator.

At the beginning of the experience, users are allowed to study the cards for a maximum of 10 minutes before all pages are flipped over and 6 sheets are chosen at random. Using post-it notes, the user is able to draw the six chosen words before sealing them in a box.

After 30 minutes, the user returns to the box, views their drawings, before being released for another 30 minutes. After an hour, the user is asked to recount the words they remember without reference materials.

Synthesizing Results:

What worked:	What didn't work:
The participant was able to easily remember words that applied to them/stood out. All words remembered they could name a distinct memory with. Out of the 8/12 words remembered, 5 of them were the ones the participant drew. When interacting the next day, the participant could only recount words that they drew.	Post-study, the participant did not have a way to reinforce memory, and struggled to remember. Created false memory of words (says words that were not there) that applied to them.
Key Learnings and Implications:	
Emotional ties make for stronger memories, but emotion without documentation can create false memories. Personal interaction with memories, and reinforcement by reminder cements them more in the mind than simply trying to remember. This method allows for recollection even if there is no emotional tie. The more interaction, the better the recollection. Overall, our assumption proved to be true! Writing and reviewing makes the user significantly more likely to cement memory, and only the words documented were the ones that remain in the person's memory for a much longer period of time.	

Top Three Solutions: AR Geocaching (No. 3)

An AR app where you can leave stories, photos, and memories for loved ones in a physical space that persists throughout time.

Key Assumption

People would enjoy tagging locations and objects with stories and sharing these tags with others.

Prototype

Users were handed a stack of Post It Notes and a pen and were told to affix them to objects and places along with a short statement about memory pertaining to the object.

Additionally, probing questions such as "how would you feel about sharing these with family, friends, and/or strangers?" and "how would you feel if these post-its could remain here forever?" in order to gauge participant engagement.

Synthesizing Results

What worked:	What didn't work:
Liked the process of reminiscing over sentimental items.	Would feel less pressure if it was anonymous.
Felt that almost everything around them had a good story.	Did not like the look of post-its/pop-ups covering their items.
Liked the fact that you were leaving physical objects.	Participants felt that the logging process was tedious, though they enjoyed the result.
Thought it would be really cool to read other people's stories.	
Enjoyed the reflection process.	
Liked being able to share stories with others that came by.	
Thought it would be cool for stories to persist for generations.	
Key Learnings and Implications:	
Handwritten tags may be more intimate/meaningful to users than typed text.	
It might be hard for physical mediums to persist over time.	

Virtual/Physical mediums also cover part of the items, so they must be aesthetic and not obscure the item/place.

Overall, this assumption was also proven to be true as participants enjoyed the chance to reflect and share stories. They mentioned enjoying providing context behind their items/places to reflect on later and show to friends.

Design Evolution

Chosen Solution

The final solution chosen from these three explored was solution #2: A virtual "tomodachi" of yourself that tends to a virtual garden. You record positive memories in this garden, which are planted as trees. When the trees bear fruit, you are reminded of the positive memories, and the tomodachi eats them to grow. Thus, Arbor was born!

From testing our experience prototypes, all critical assumptions from our three possible solutions were shown to be true. However, out of the three solutions, Arbor aligned most with our key learnings from needfinding (finding new ways to preserve stories, cementing positive memories, human connection). Our results from our experience prototype shows that the main idea of documentation and reminders at random intervals kept memories fresh within participant's heads, meaning that this solution would aim to solve the problem we were looking to address that people do not have an efficient and intentional method to recall past positive memories.

In addition, Arbor felt the most relevant in an increasingly rushed and stressful world. The charming indie feel mixed with the emotional ties one creates in addition to virtual personas creates a unique motivation for users to want to look upon previously logged memories, offering potentially much-need mood boosters throughout the day. Plus, we all got very excited about the idea when it first came up.

Tasks

Simple: Viewing an inserted memory.

The core functionality of our app revolves around a user's ability to reinforce and cement their past positive memories through reviewing them in an efficient and delightful manner through this task. This task would be the most frequently completed activity, and so it is essential that it is intuitive and effective. To do this task, users must "feed" their in-app character by clicking a ripened fruit (as directed via in-app notifications), viewing the memory logged within the fruit, which will then prompt users to tap to "eat" the fruit once the memory is reviewed in its entirety.

Moderate: Log/document a memory ("Planting" a memory, can be viewed when ripe)

The secondary core functionality of our app revolves around a user's logging of their past positive memories to review in the future. This task would be the second most frequently completed activity, as users would be documenting positive memories as they occur throughout their lives. Since this task requires more of a cognitive/physical load due to direct user input, it is critical that this task is able to be completed efficiently and without friction. To do this task, users must "plant" a memory by clicking on an open plot in their world and choosing a fruit seed to plant. They would then be guided through the steps of logging a memory, and once reviewed, a sprout would take the place of the plot, indicating that a memory has been logged/ "planted". When the fruit ripens over time, it could then be viewed.

Complex: Share your memories with friends/family/future generations

Although Arbor could function well as a journaling tool without sharing memories, we see this task as a tertiary core to Arbor due to the value of human connection we are looking to embed in the app. Users must "share fruit" to complete this task by clicking on the post office in the main town of Arbor. Here, they can view all memories (all "fruit") they have received from their friends, along with having the option to send fruit. By clicking the "send fruit" button, they would be guided through the steps of doing so- picking a friend to send to, picking a memory to send to them (and the associated fruit they would be receiving the memory in the form as), and a final confirmation screen that their fruit has been sent.

Design Evolution Visualization(s) and Rationale
Initial Sketches
After deciding on our solution and the tasks we needed to implement, we began rapid sketches to brainstorm different design directions, such as in AR, wearables, and mobile apps. From these, we narrowed in between wearables and mobile apps for the realization of Arbor due to accessibility, feasibility, and interest.

Wearable (via Smart Watch)

In the end, we decided to do a mobile app. Although a wearable design via watch would have been unique to explore, the limited screen size and lack of widespread smart watch accessibility would severely limit interactions with the app. Mobile has more global users, a bigger screen, and more storage. This is vital as the app must take in all user-inputted information, along with making documentation easy.

Once our method of realization was decided, we storyboarded what the user interaction to complete the tasks may look like using a whiteboard and markers. To determine interactions, we kept in mind what was most feasible, intuitive and fun:
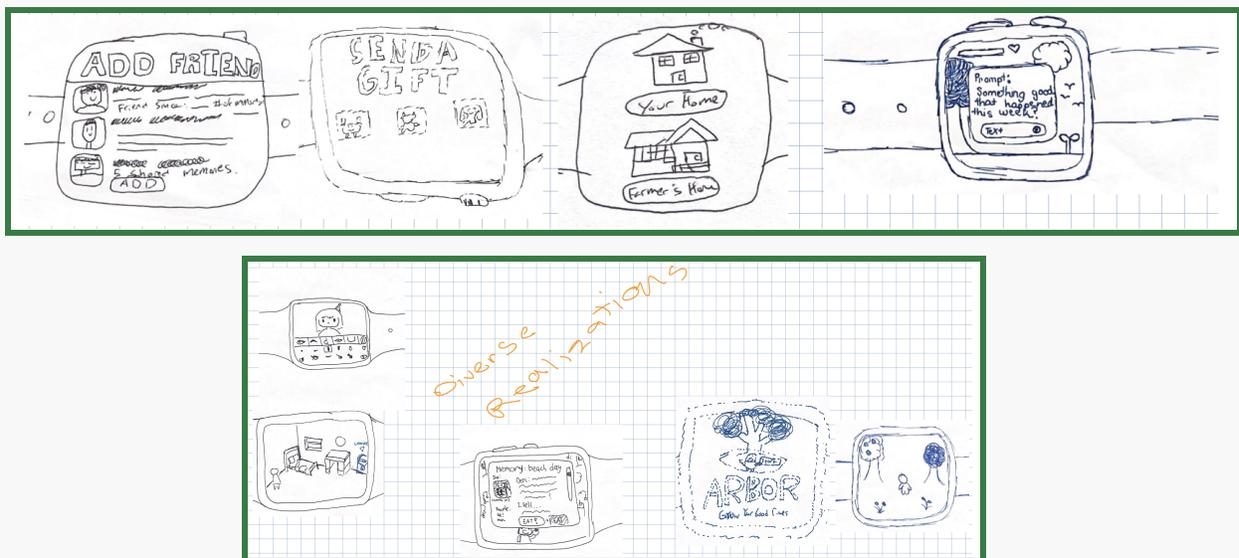

Figure 5. *Sketches for a wearable app.*
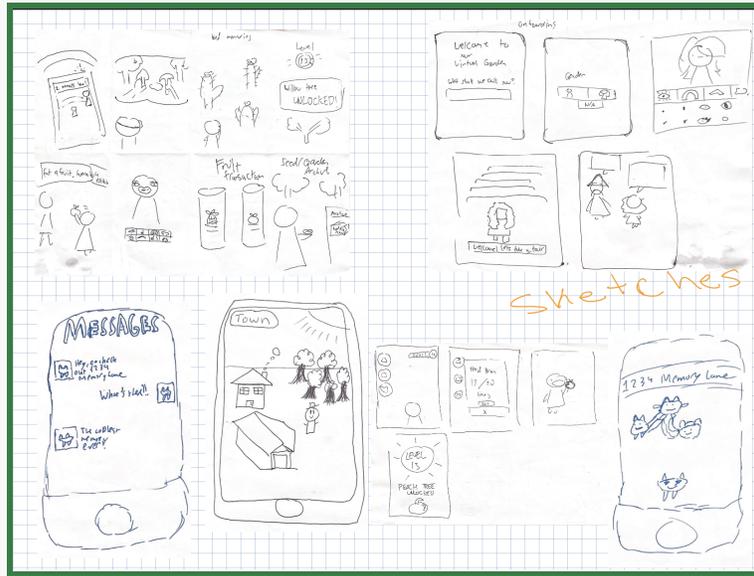
Mobile

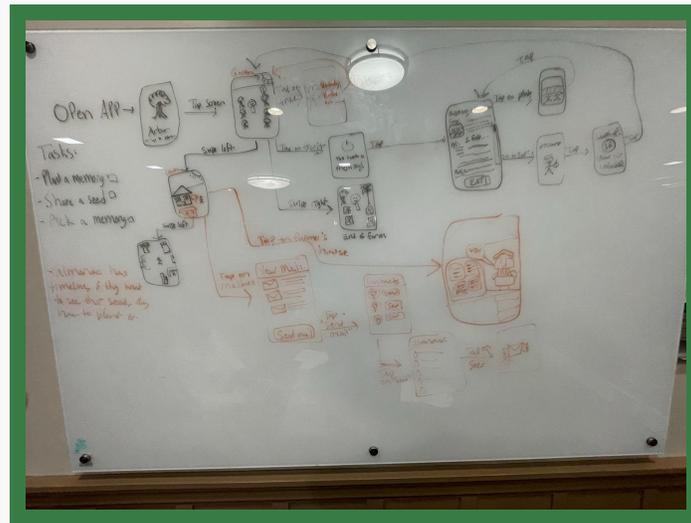*Figure 6. Sketches for a mobile app.*

Figure 7. Storyboard for a mobile app.

Lo-Fi Prototype

The storyboarded interactions guided the creation of our lo-fi prototype. Using Goodnotes, all screens and widgets of the prototype were drawn.
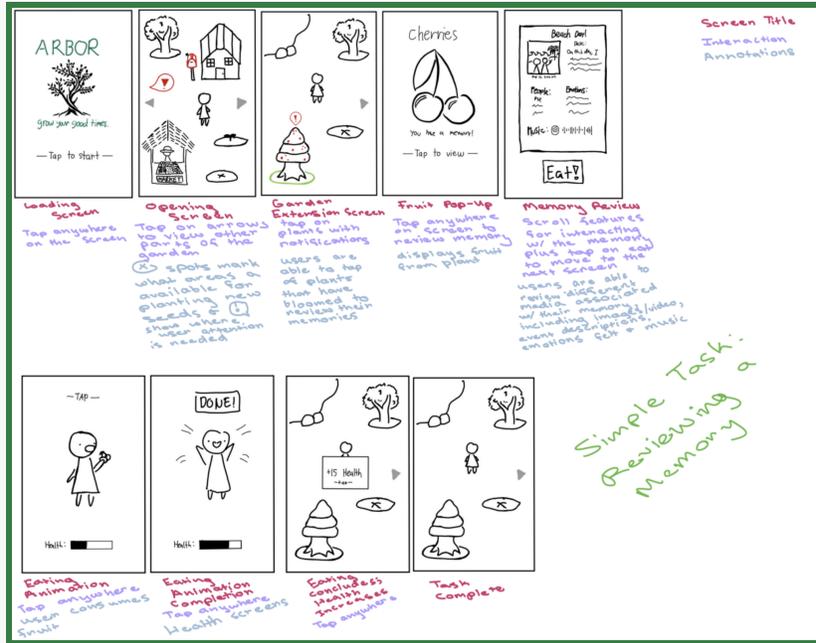
Simple Task: Reviewing a memory

Figure 8. Task flow for eating a fruit and reviewing a memory..

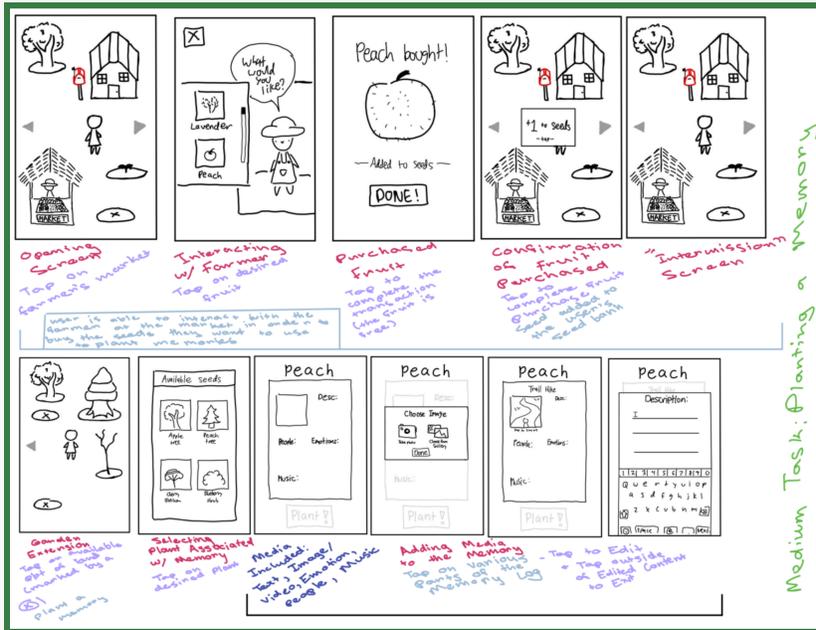## Moderate Task: Logging a Memory

Figure 9. Task flow for planting a seed and logging a memory.
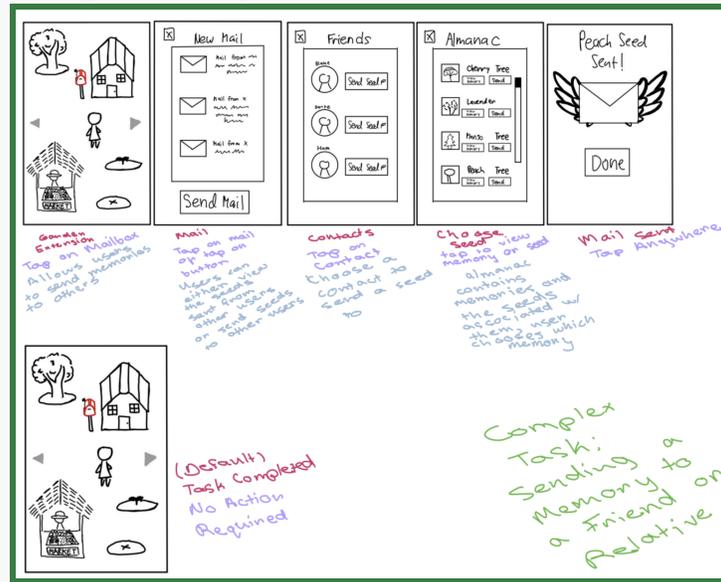
Complex Task: Sharing a Memory

Figure 10. Task flow for mailing a seed and sharing a memory.

Usability Testing

To create the prototype for usability testing, all of the drawn screens and widgets were then printed out. When participants interacted with the "front" screen, the next paper screen resulting from their action was slid in front. They then interacted with that new "front" screen. Widgets were overlaid on the front page to display notification and new tasks.

To find participants, we went to Downtown Palo Alto and randomly asked individuals if they'd be willing to volunteer to participate in our test. We aimed to find a diversity of participants based on age, gender, and background.

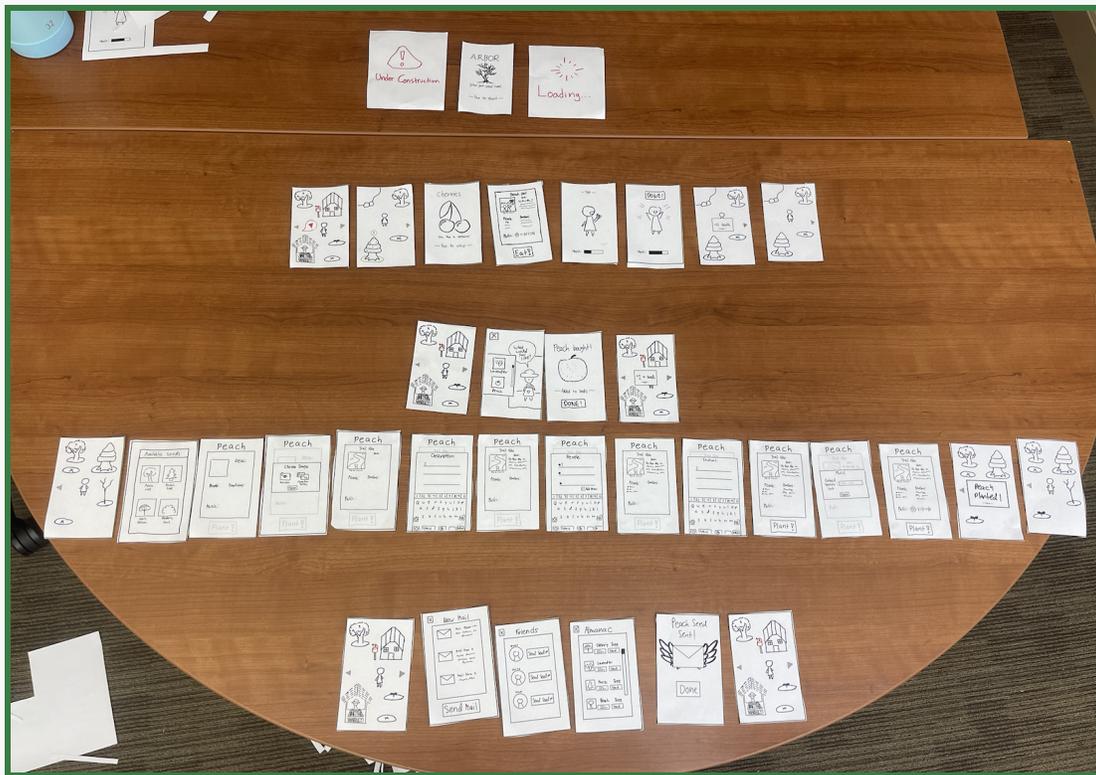*Figure 11. Bay Area HS Senior interacting with the paper prototype.*

Figure 12. Bird's-eye view of full prototype screens.

Key Measurements and Usability Goals
Before testing our prototype, we set out to create a rubric of usability goals that would help us gain a clear picture of our key successes and failures at this stage. Namely, we strived to create an app that would be **efficient**, **robust**, and **fun**.

To test efficiency, we aimed for completion of the simple task in under a minute, completion of the moderate task in under 2.5 minutes, and completion of the complex task in under 5 minutes. Allocation of times was done purposefully, as the simple task would be the most common of the three, and thus should be fairly quick for the user to complete. For robustness, we kept a running log of "critical incidents" (CI), or moments in the test where the participant was confused, did something unexpected, or ran into trouble with the prototype. Each time a CI was logged, we also assigned it a severity rating from zero (not an issue) to four (UI catastrophe). Our goal was to have no more than one major (3 or greater) CI per participant, and a sum of no more than 5 for each participant's total CI severities. Lastly, we gathered qualitative feedback and quotes in order to gauge our final goal, how fun the app was.

Low-Fi Findings

After conducting testing on four participants, we assembled a valuable collection of insights. In the big picture, we found that navigation and task flow was generally intuitive, and did not require tutorial or instructions. At the same time, participants had difficulty differentiating which elements of the UI could be interacted with. And our complex task generally took the longest time and led to the most negative critical incidents.

To better understand these insights, we compiled the following table of critical incidents, formed from our observer's notes:

Critical Incident	P1	P2	P3	P4
Difficulty moving the character	-3	0	0	-3
Clicked on tree with no fruits	-1	-1	-1	0
Clicked on rocks/decor	0	-1	0	0
Thought mailbox was part of house	-3	-3	-3	-3
Clicked on exclamation immediately	0	0	0	0
Couldn't figure how to plant seed	0	0	0	-3
Thought mailbox was for receiving only	-2	-2	0	0
Thought you couldn't choose seed	-1	0	0	0
Total Sum (Severity):	**-10**	**-7**	**-4**	**-9**

Figure 13. Table of critical incidents.

In essence, we fell short of our aims to be robust, with three out of four participants having a CI sum worse than the baseline of -5, as well as half the participants having more than one major (3 or greater) CI. However, as can be seen in the content of the

critical incidents, most of the issues revolved around the third task of sending mail. To better visualize this, we can look at the timing of all three tasks:
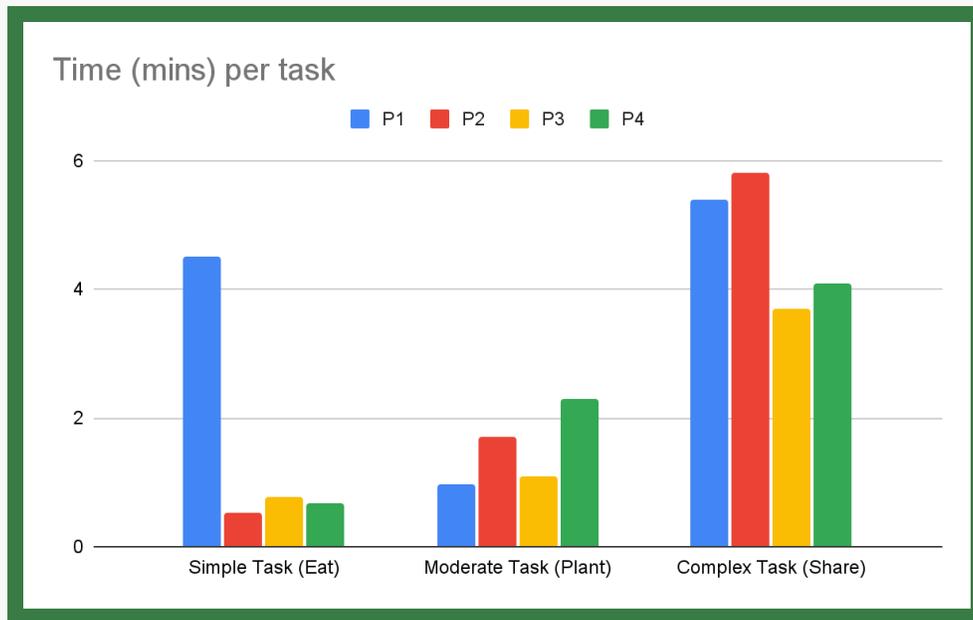

Figure 14. Graph of time (mins) to complete each task.

Timing each of the three tasks helped provide a clearer picture of relative difficulty, with our complex task being the slowest task on average by far. For P1 and P2, our complex task was particularly confusing due to the proximity of the mailbox to the house. By placing them right next to each other, we had violated Gestalt principle of design, namely that close proximity of two objects leads people to group them together:
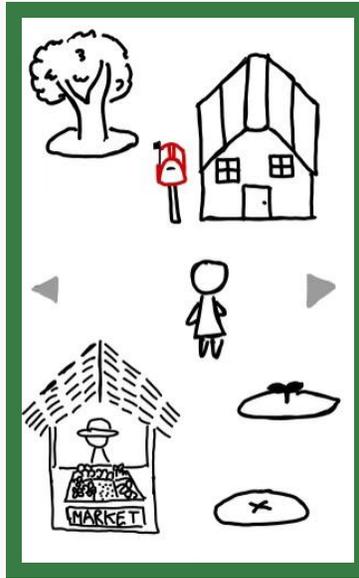
Figure 15. Screen depicting mailbox and house.

Due to the relative size of the mailbox, and its proximity to the house, the two participants grouped them together, and kept tapping on the house when trying to send mail. Another participant remarked that they associated mailboxes with incoming mail, rather than outgoing mail. P1 was also an outlier on our simple task, where they proceeded to go to the market to buy fruit when asked to eat one. This left us in a state of partial success with our efficiency goal, as without this outlier we were able to hit our benchmarks in testing. Lastly, for our goal of being fun, we were pleasantly surprised to hear all four participants remark (unprompted) that interacting with the prototype was "fun," as well as "cute," "intuitive," and "enjoyable."

Low-Fi → Med-Fi Changes
We used the feedback gained from the Lo-Fi prototype to dictate the changes that needed to be implemented from our initial design.

No major changes were made to the tasks themselves, as the flow of each was reported to be fairly intuitive and fun by participants. However, from our results we determined major changes needed to be made in terms of the layout and cosmetic designs of the Arbor world.

Major Revision #1: Post Office
In our Low-Fi prototype testing, we found that multiple participants could not distinguish the mailbox and house as distinct buttons. Furthermore, some did not associate the mailbox with outgoing mail, only incoming mail. To remedy this, we added a post office, which serves as a clearer center for all mail actions.
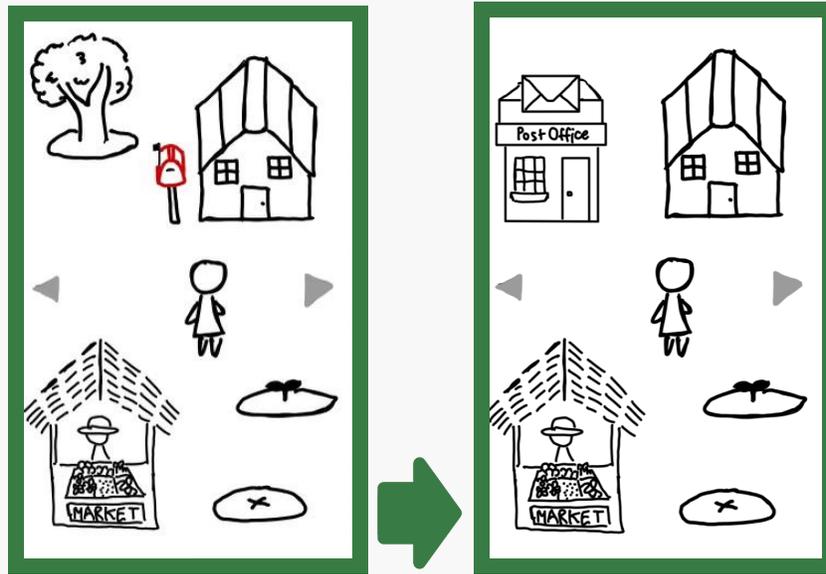
Figure 16. *Prototype revisions from mailbox to post office.*

Major Revision #2: New Market

Our testing revealed that some participants were confused by the marketplace, and believed they were acquiring fruit (when in actuality they were acquiring seeds). We also heard feedback that the window was too small, and would require too much scrolling to view all seeds. To remedy these issues, we displayed seeds instead of fruit, and added a much larger selection on the first page.
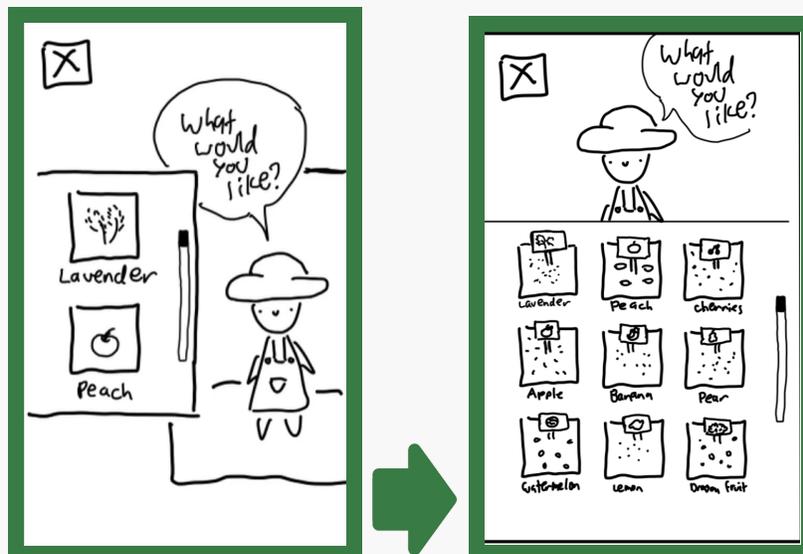
Figure 17. *Prototype revisions from fruit market to seed market.*

Major Revision #3: Conscious Color

One piece of feedback we received last week was that our notification for a grown fruit evoked the imagery of a warning. This was due to the use of a bright red exclamation point. This week, we were much more conscious about the colors we used, opting instead for a light green hue that aligns more with our natural theme.
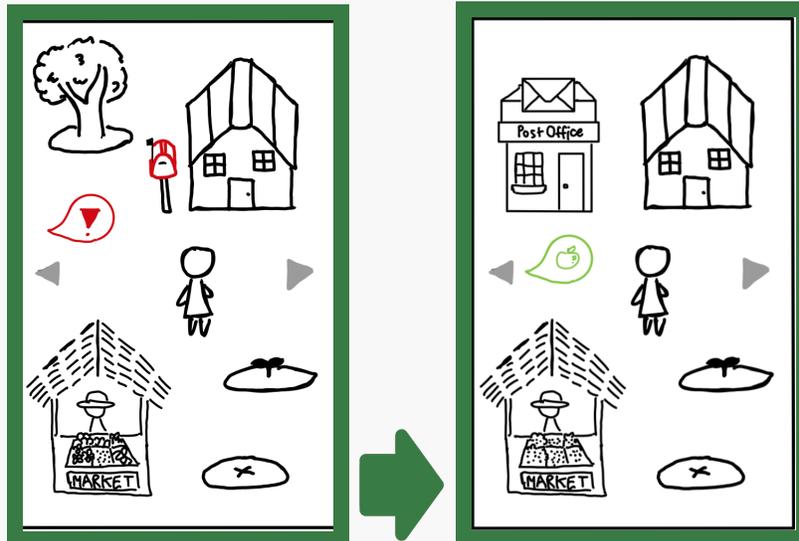
Figure 18. *Prototype revision from red alert to green.*

Once all changes that needed to be considered were re-sketched, we used the sketches to drive our direction when creating the Med-Fi prototype using Figma.

Medium-Fi Prototype
Simple Task: Viewing a Memory
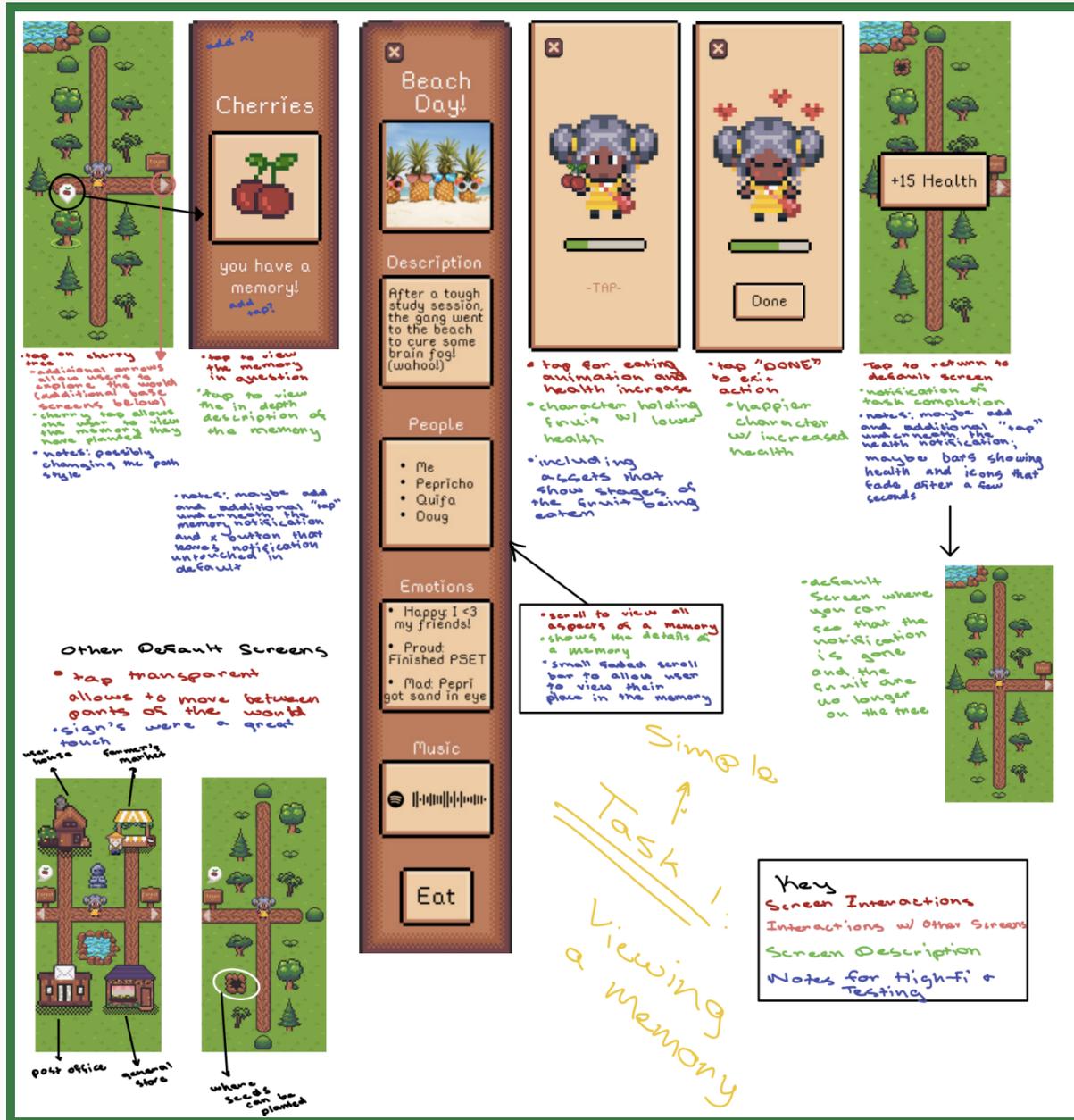
Figure 19. Med-Fi task flow for eating a fruit and reviewing a memory.

Moderate Task: Logging a Memory
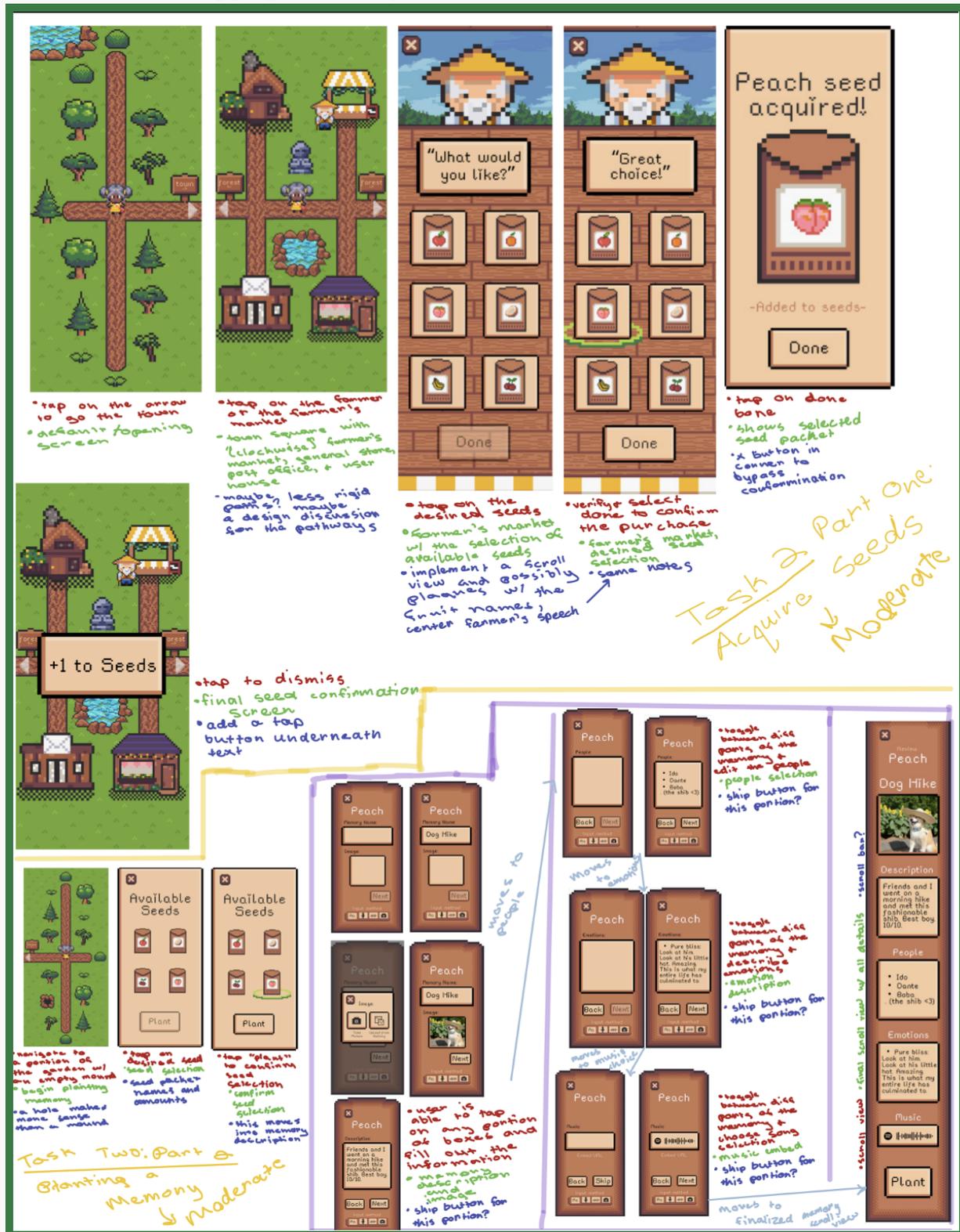
Figure 20. Med-Fi task flow for planting a seed and recording a memory.

Complex Task: Sharing a Memory
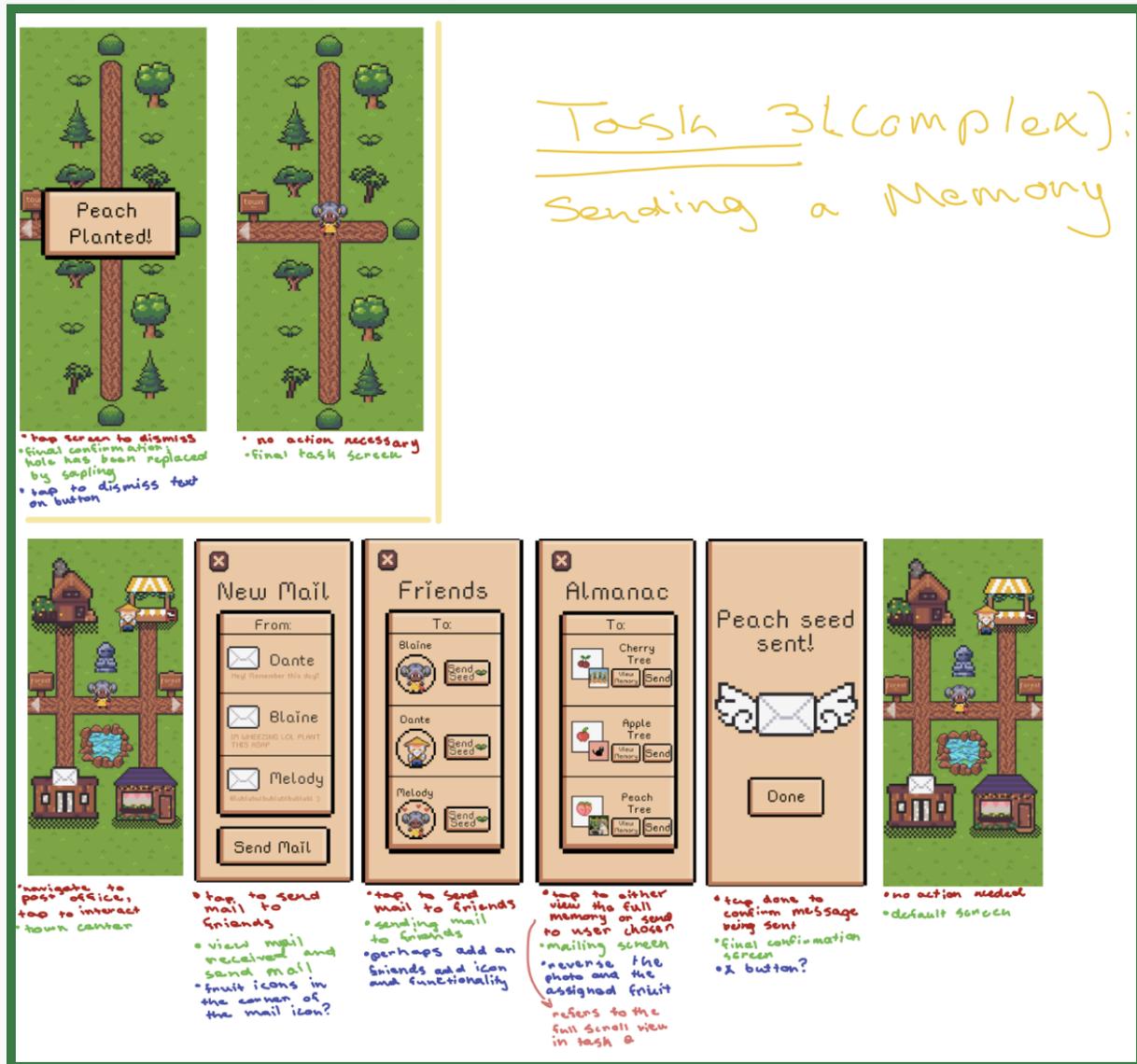
Figure 21. Med-Fi task flow for mailing a fruit and sharing a memory.

Heuristic Evaluation

Once the med-fi prototype was completed, a group of four heuristic evaluators tested our prototype to uncover usability issues that needed to be resolved. In total, there were **38** severities found within a range of **13** total heuristic categories. The breakdown was as follows:
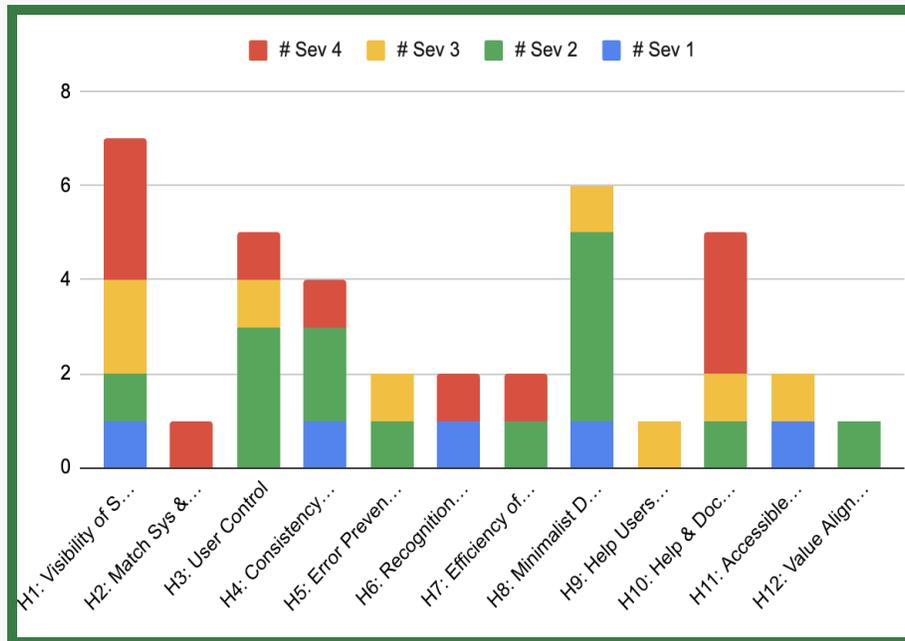
Figure 22. *Graph of severities*

Severity Level	No. of Violations
4	11
3	8
2	14
1	5

Figure 23. *Table breakdown of violation counts.*

The trends displayed a need to focus on:
- **H1**: Visibility of System status (7)
    - Guidance/Labels
- **H3**: User Control (6)
    - Unimplemented features
    - Fix exits (back buttons)
- **H8**: Aesthetic & Minimalist Design (5)
    - Changing/adding labels
    - Centering text and sizing in phone
- **H10**: Help and Documentation (5)
    - Guidance, navigation on where to go.

Key Takeaways

The most common issue was finding what to do next in the world task-wise. From there, most violations were cosmetic, with a particular focus on labels, aesthetic consistency, exits/buttons, and unimplemented features (i.e. adding friends).

Severity 4 Trends
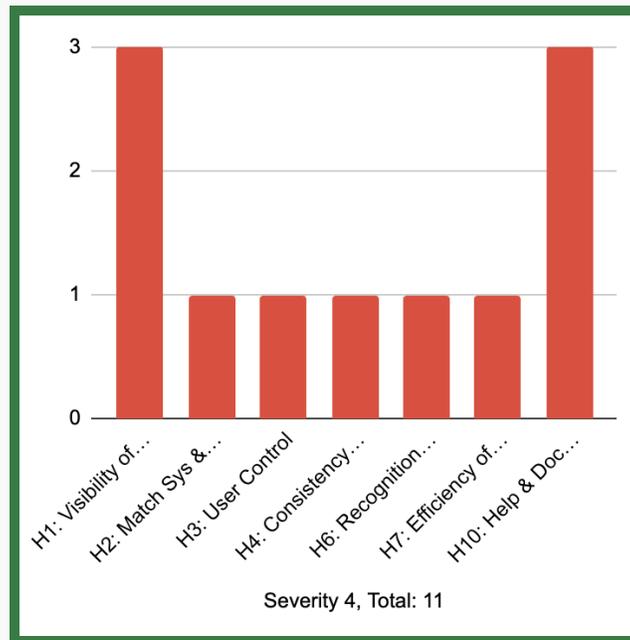
Figure 24. Graph breakdown of severity 4 violations.

For our severity 4 violations, six called for major changes to the app's UI. These changes mainly centered around confusion on where to go and what to do next. In other words, there was a need for guidance before, during, and after each task. This suggested the need for some kind of documentation or tutorial to aid in completing the task flow.

The other five violations called for minor changes to the interface. For instance, creating consistency between the "next" and "skip" buttons, rerouting where the exit button leads, and changing a single animation.

Severity 3 Trends
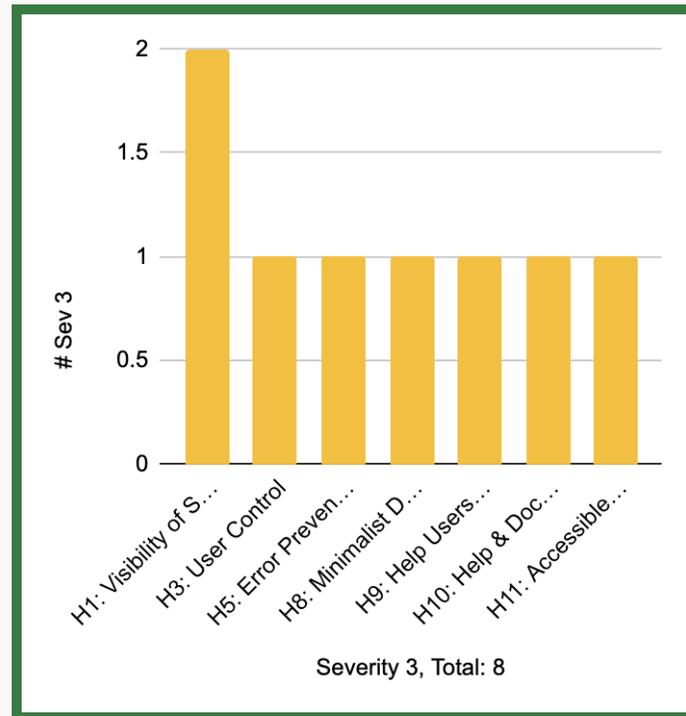
Figure 25. Graph breakdown of severity 3 violations.

For severity 3, we found that two of our violations concerned user freedom and control. For example, the evaluators wished that they had the option to delete memories, which we did not include in this iteration. Several of the violations also revolved around features that were not implemented for the purposes of the prototype. This served as great confirmation to us that these would be helpful in the future (such as the option to buy more than one fruit), and led us to prioritize them for the hi-fidelity prototype. The rest of the violations concerned minor UI changes such as changing the name of the "almanac," shifting around image placements, and centering text.

Product Revisions
Revision No. 1: Addition of a Tutorial
Given that the most common feedback concerned not understanding the world and what to do next, we decided to begin Arbor with a story-like tutorial, led by the farmer, to introduce the world. This would address all major changes for severity 4, as it provides all needed context and next steps. Though should only be needed once, players will have the option to ask the farmer within any task for guidance if need be for accessibility (i.e. cognitive disorders):

Figure 26. *Addition of a tutorial for hi-fi prototype.*

Revision No. 2: Animation via Gif
Since we wanted users to develop a bond with Arbor's characters and setting, we decided to bring it to life a little using animation. Choosing to animate only the objects which are clickable, this change also helps to address the common feedback that it is unclear what the user can tap on.

Figure 27. *Animation frames for the main character sprite.*

Revision No. 3: Mail UI Changes
Another revision we made was making better use of space by removing unnecessary constraints. For instance, in the mail task, the length of each box was made to be the width of the screen, to allow us to fit more profiles into one screen and minimize the amount of scrolling necessary. We also switched placement of images and fruits

(before, the fruit was the larger image) to better highlight the more important information (i.e. which memory is being shared). Overall, these changes addressed a lot of the feedback of aesthetic consistency and layouts from severities 1, 2, and 3, making all screens look more clean and consistent.

Figure 28. Revisions to mail screen layout.

Revision No. 3: Informative Labels for Available Seeds
For this revision, we added labels to the "available seeds" screen, including the name of the corresponding fruit as well as the number of available seeds in the user's inventory. This addressed severity 3 and 4 feedback on the visibility of system status and accessibility. With these additions, users could easily know what fruit they have and how many, thus eliminating guesswork and creating a smoother experience.

Figure 29. Addition of seed name and count to available seeds screen.

Core Values

As we continued to develop our brand and app, we set about defining some core values for the project. Namely:

Mindfulness
We aim to promote reflection and emotional well-being. This is expressed through the tranquil, natural landscape of our app, which provides the user an opportunity to reflect. Furthermore, the planting of seeds is essentially an exercise in journaling, which helps keep the user in a state of mindful contemplation about their life.

Personal Growth
We want to offer visual representation that individuals flourish and evolve, and that reflection can lead to deeper understanding of oneself. This is highlighted by the growth stages of the trees, which develop over time to showcase the evolution of the garden. Furthermore, it is shown by the rise in the character's health bar each time they eat a fruit, signifying that they are growing stronger as a result of their experiences.

Human Connection
We offer a platform for users to uplift each other and celebrate each other's experiences. This manifests itself in friendly interactions with the NPC farmer, as well as the opportunity to share memories with friends through the mail.

Simplicity
Our simple interface and UX make spreading happiness as easy and fun as possible. This is seen through our minimalist sprite and background elements design, as well as our simple and intuitive controls/input methods.

Playful, Positive Reminiscence
We seek to transform the way people view their past, fostering optimism and resilience. This is the central theme of our app, as we brand it as a place to store positive memories about the past, pushing our users to reflect on their lives with an uplifting lens. Thus, we use playful animations and an 8-bit theme to add joy, nostalgia, and excitement to the process of looking back at past memories.

Value Tensions
At the same time, we do have some value tensions that we aim to balance in the creation of our app. Namely:

Positive Reflection vs. Realism
We want to balance positive reflection with the authentic portrayal of complex memories. We don't want to pretend like all memories can be happy all the time, which is a potentially unhealthy way to portray life experiences. Rather, we want to push our users to find the positives in their lives, and to use this opportunity to reflect on the things that they are grateful for.

Simplicity vs. Personalization
We also seek to balance simplicity with user personalization for expressive engagement. We want to add a lot of customization features to help attach the user to their character and garden, but not make the process overly complicated for the user. For this reason, we keep the outfits and seed types fairly minimal, allowing for some customization, but maintaining a sense of consistency across all gardens.

Playful Reminiscence vs. Depth of Reflection
Lastly, we try to balance playful interaction with deeper emotional engagement in reminiscing. Although our app is game-like and uses an 8-bit format, we want to emphasize the importance of active and regular reflection. We want Arbor to be place for lighthearted and serious reflection alike, where users of all intentions feel comfortable keeping their memories stored.

Final Prototype

Tools Used
We relied on two main tools for developing this prototype:

1. **PiSKEL**

The first tool we used was Piskel, an application for creating, editing, and animating pixel art. Given that Arbor is completely realized in pixel art, we relied on this tool almost exclusively to create the app's environment.

Figure 30. Piskel app rendering of an Arbor tree.

Some pros of this service were: easy development of assets; ability to create multiple keyframes for animation; ability to export as png, sprite sheet, or gif; and easy to resize graphics. At the same time, some cons were the limited selection of design tools and the fact that complex design features are harder to use.

2. **React Native**

The second tool we relied on was React Native, which we used to host our hi-fi prototype. Using React Native allowed us to implement a small back-end, as well as create mobile screen-to-screen functionality that could build off of the functionality of our medium-fi prototype. Some pros of this tool were ease of implementing features, such as scrolling, button-pressing, or embedding gifs. However, this tool was not particularly well-tailored to game development, making it difficult to implement our vision for Arbor as a mindfulness app disguised as an 8-bit video game.

Wizard of Oz Techniques

Since we did not have a user base or time to implement an extensive back end for this prototype, we included a few Wizard of Oz techniques to help simulate the

experience of using the Arbor app:

Tree Growth: Instead of implementing a back-end method for tree growth, where fruits become naturally ripe over time, the user starts the app with a fruit ready to pick. This helps expedite the demo so the user doesn't have to wait to start the simple task.

Sending Mail: Since we don't have a user base, the social component of the app is simulated. Thus, sending mail to a friend is a function we are simulating for the sake of the prototype.

Hard-Coded Features

Several aspects of our prototype were hard-coded, so as to maintain the audience's immersion in the product while also illustrating use cases for the product:

Multi-media Inputs: Our prototype does not have an extensive back end for supporting multimedia inputs, and thus we hard-coded text, photo, and embedded media when planting seeds and reviewing memories.

Social Component: Since our app does not yet have a user base, we hard-coded friends into the system. Thus, if you tap on the post office, there is hard-coded mail from friends, and a list of contacts you can send seeds to.

Customization of Garden: Seeing as our Hi-Fi prototype does not support full customization of the character or garden (as this would involve creating a backend to track these changes), the character's outfit and the layout of the garden are hard-coded in, as if the user set up their app this way.

Seed Inventory: For similar reasons as the previous point, we had to hard-code the seeds in the user's inventory at the time of planting or sending mail, as keeping track of the seeds would require a more significant back-end.

Reflection/Next Steps

Overall, the Arbor project was an incredibly valuable opportunity to jump into the deep end and try something radically new. Coming into this project, no members of our group had ever coded an app. None of us had any experience with React Native,

or creating pixel art assets. Thus, working on this project gave insight into the greatest joys and challenges involved in creating a product from scratch. From the very first day coming together as a group, we had a long list of tasks to complete, and not much time to complete them. Completing the needfinding process in a matter of weeks before starting to prototype, there was a great deal about the design process we had to learn fast.

Through it all, we gained a lot of appreciation for the thought and care that goes into designing a quality product. After being inspired by the thoughts and experiences of our interviewees, we knew we wanted to make something that they would truly appreciate, and that could bring delight to a large diversity of users. Weaving together our shocking and novel insights, we trusted in the design process throughout it all, and little by little, Arbor started to take shape.

One of the most poignant learnings we will take from our studio this quarter is that personal legacy means different things to different people. Some, like the academics we interviewed, complete their work with an expectation that it will not be read several years past its date of publication. Others, like the parents we interviewed, see their children, and the heirlooms they pass on, as long lasting instances of their familial legacy.

We suppose that Arbor is an example of *our* legacy, and we are really proud to have made something in so short a time that embodies the full design process from start to finish. As we continue to explore fields of software engineering and product design, we hope to build on these foundational skills, and to go on to create projects that surpass Arbor in quality, technicality, and applications.

Still, we will maintain a fondness for the Arbor project, which still has room to grow itself. Were we to continue working on it, we would have loved to have added character and garden layout customization, more tree types, a fish-eye world perspective, and inside environment for the character's home and general store. Expanding on its reminiscent theme, we would have added notifications for when fruits were ripe, and an algorithm for growing fruits at an appropriate rate. Furthermore, we would have liked to build on the app's accessibility standpoint, adding more input methods (and potentially NLP) to help support more kinds of user memory inputs. However, for now, Arbor will remain simply a positive memory that we gingerly add to our garden.