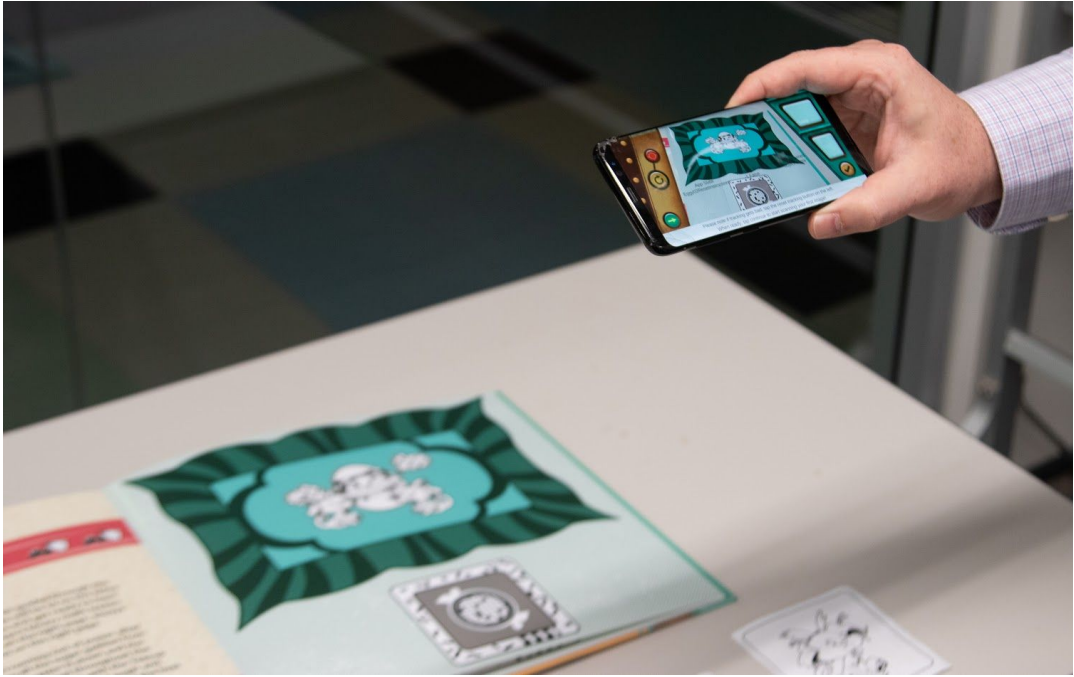


C-Spresso AR



Designing C-Spresso AR

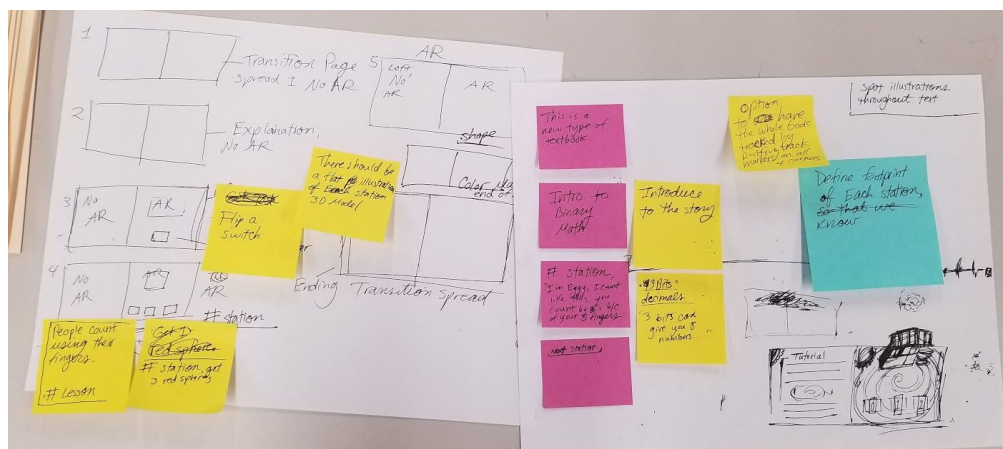
Designing the AR experience portion of *C-Spresso* had to take into account usability, UX, education and game objectives. This process would depend on taking what we learned during the production of the VR experience about teaching through play. We knew that immersing the user in a light-hearted, engaging experience was effective in teaching CS concepts. Results from the high school user study revealed this after playing *C-Spresso VR*.

Our next challenge was to update the traditional format of the textbook, which is still commonly used in K-12 education. We wanted this application to feel like an extension of the VR experience, so we went back into the research and designs created in the early stages of the VR application and altered the experience design to fit into an AR medium.

It was important for us to construct the narrative so the AR experience felt like an extension of the VR experience and not like its own separate application. The gameplay of both the VR and AR experience may also appeal to some users more than others based on their preference of VR or AR. We are also excited to test users in both applications and observe what the learning outcomes are of each; if they differ at all and why, if one is more successful at teaching CS concepts or not.

Technical issues would present another set of challenges because the AR experience starts with a physical book, where each station is presented on its own spread. For tracking purposes, we decided to print in a lay-flat format. The lay-flat book is designed so the book stays open without having to manually weigh both sides down. This allows the user to use the book hands-free and also allows for better tracking, since we didn't have to worry about tracking images warping due to the natural bending of the paper as it gets close to the center binding.

Creating an Interactive Book



This is a photo of the initial layout planning phase. As designers began putting the idea of an interactive book on paper, creative problem solving followed.

Decisions had to be made such as:

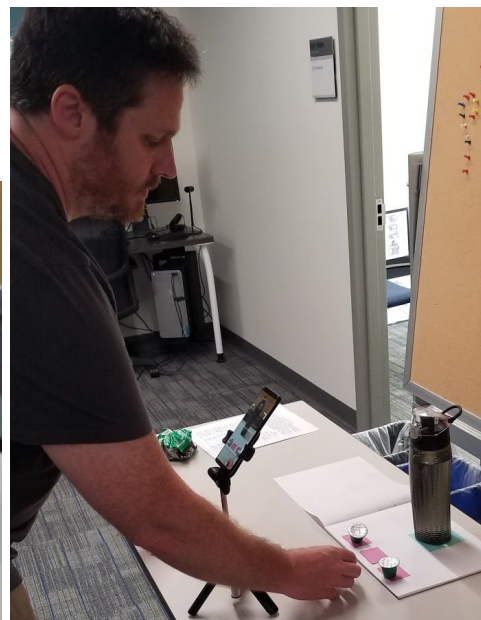
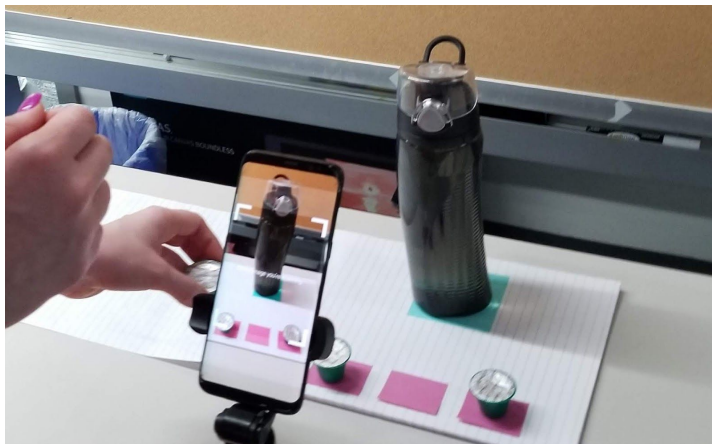
- How many interactive/gameplay loops would be on each page
- When to start the interactive within the book
- How to train the user to interact with the pages via AR and a device
- How to design the layout of the spreads with well-sized tracking symbols, illustration, and text

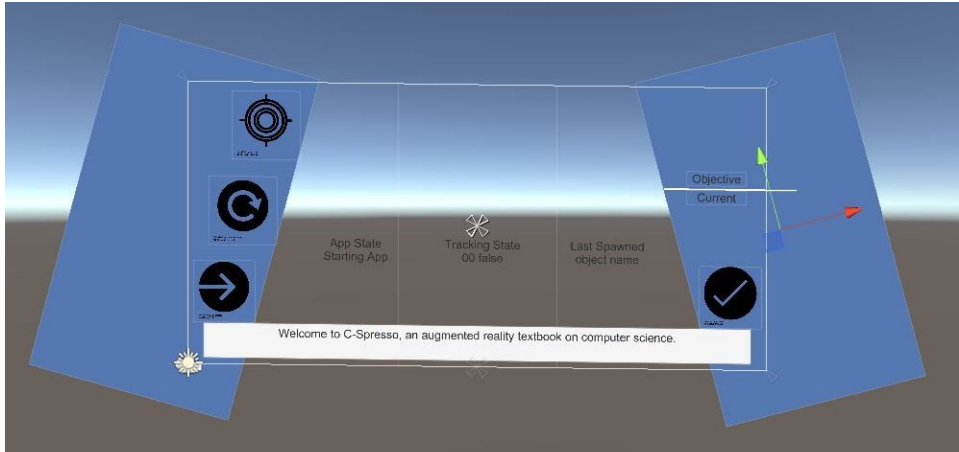
After paper prototyping and playtesting, the team came up with the following creative solutions:

- 1 gameplay loop per spread, so as not to overwhelm the user
- Introduce the user to the story and how it relates to what interactives will be in the upcoming pages
- Have 1 tutorial spread before any over interactives. The tutorial should teach the user how best to position the phone over the tracking devices and lightly introduce them to the UI.
- Layout was kept minimalistic with large, open space and solid colors. This made it easier to see the tracking symbols on the page and easier to place objects on the page during AR interaction.
- Text was not on any page that had a tracking symbol.

Device Orientation

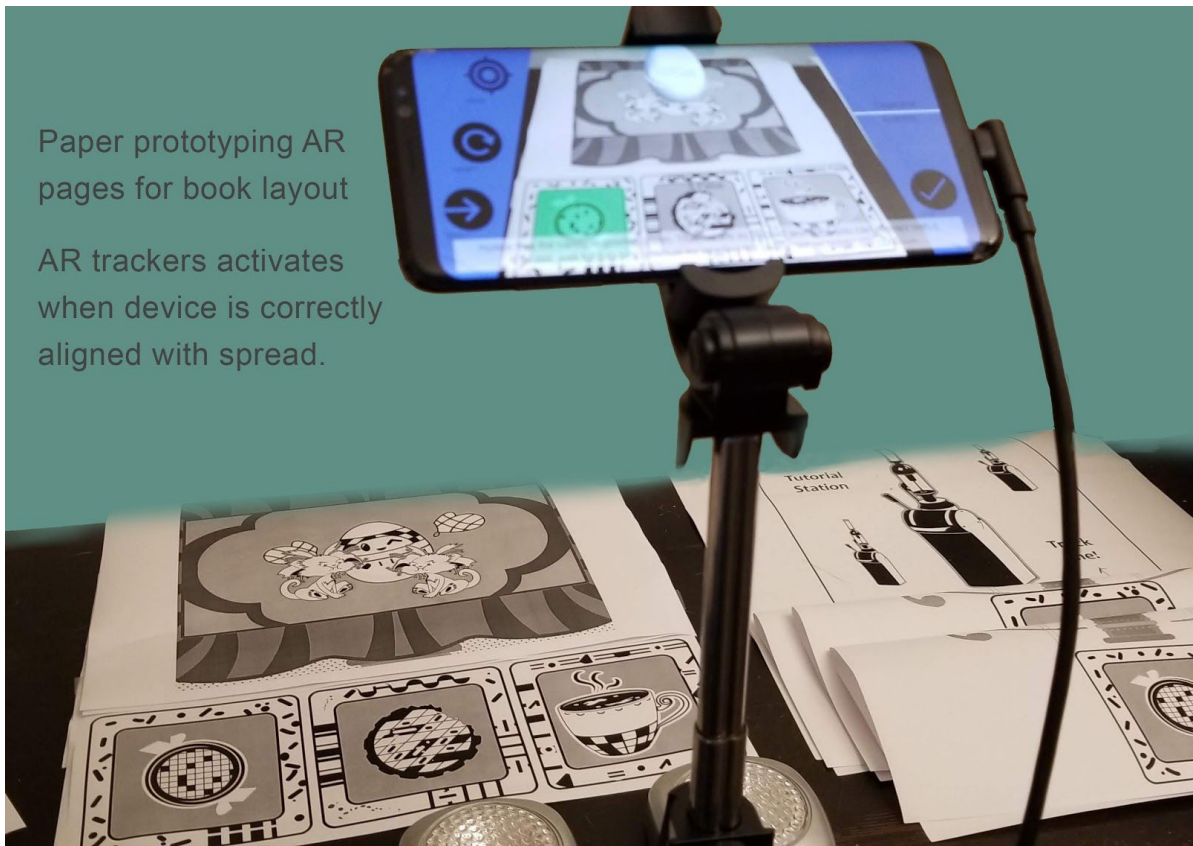
After several playtesting sessions during the prototyping phase, the team decided to stick with a horizontal orientation. The book was meant to be interactive in tandem with a digital device, so creative decisions of the layout were taken into account at the beginning of prototyping.



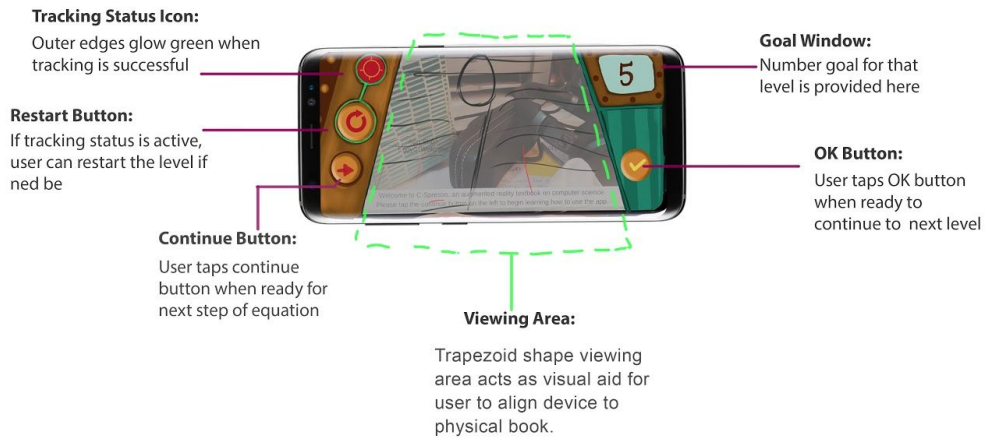


Paper prototyping AR pages for book layout

AR trackers activates when device is correctly aligned with spread.



Cspresso AR: UI Diagram



Finalized Screen Design

● UI is horizontal to best accomodate the wide range of the book spread.

Button Designs

Inactive	Active

Hiding and Revealing

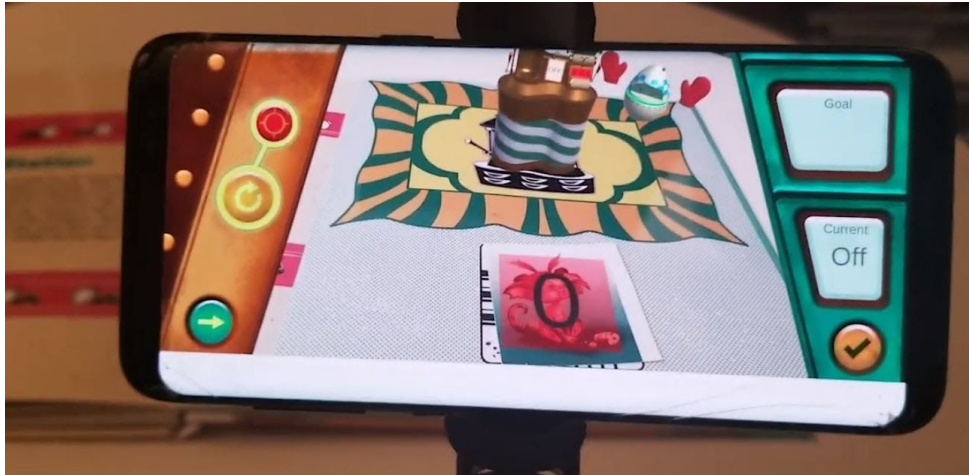
We started with the stations and focused on the interaction design specific for each one. We realized that if we extracted the gameplay and mechanics from these stations, that this would be a starting point for building the AR experience.

The levers of the stations would have to be abstracted away into a tracking based interaction. Tracking based interaction involves a tracking symbol being hidden (via the user's hand) and then revealed. This simple interaction involving hiding and revealing an image suited to the nature of binary math, which is either 0 or 1. This interaction became the mechanic for *C-Spresso* AR.



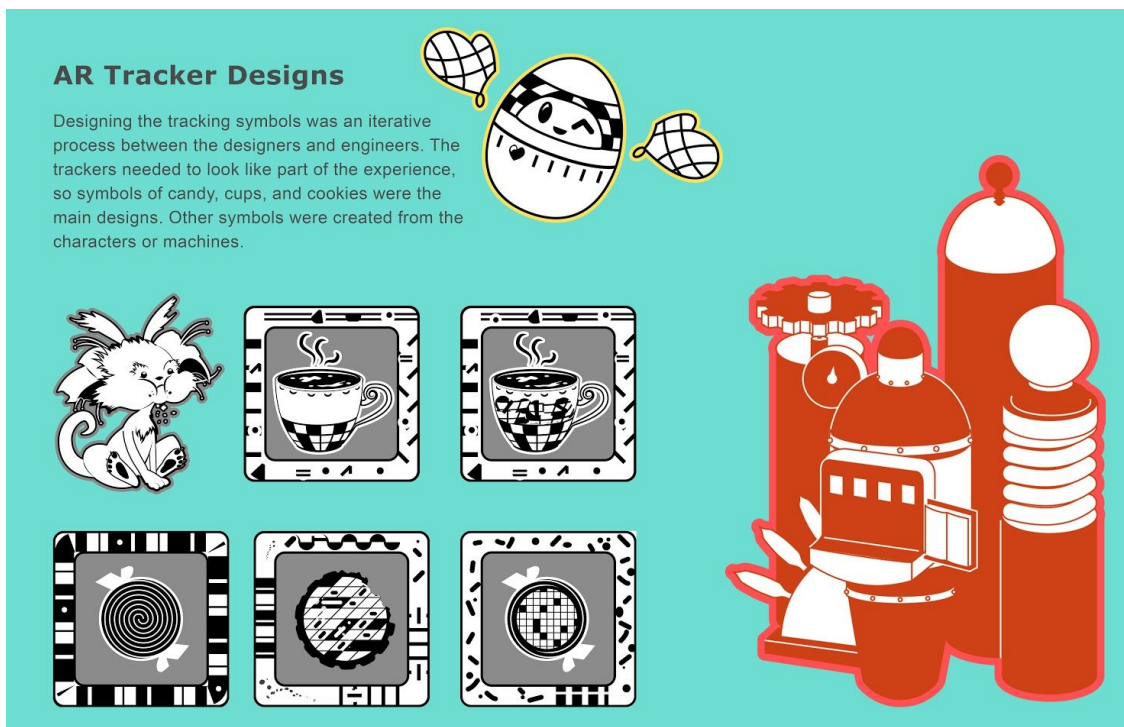
The user would turn the binary numbers on and off by blocking the tracker, then revealing it. This interaction replaced the grabbing and pulling of the levers. We tied this into the story by making the trackers look like bits of candy, cookies, and cups of coffee so that the object used to block the tracker is a card with the sugar goblin on it.

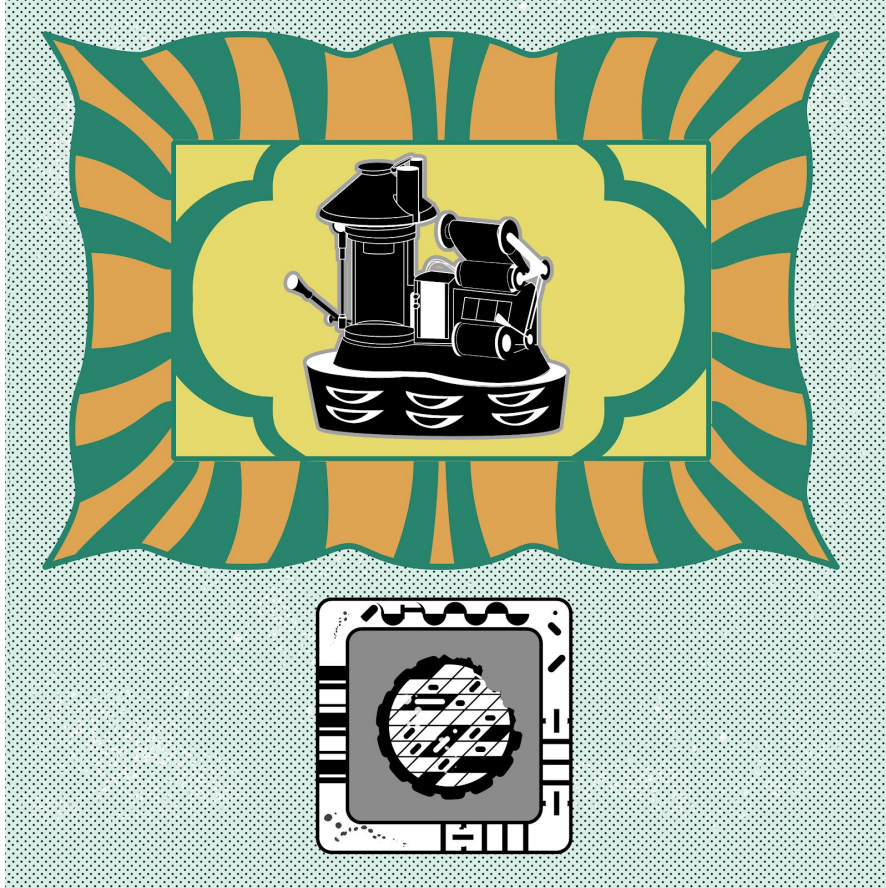
The narrative structure behind this started right after the starting event of the story, when the ship was marooned by an asteroid. In the AR experience, you are helping the ship make its way back to its home planet, of Desert Star.



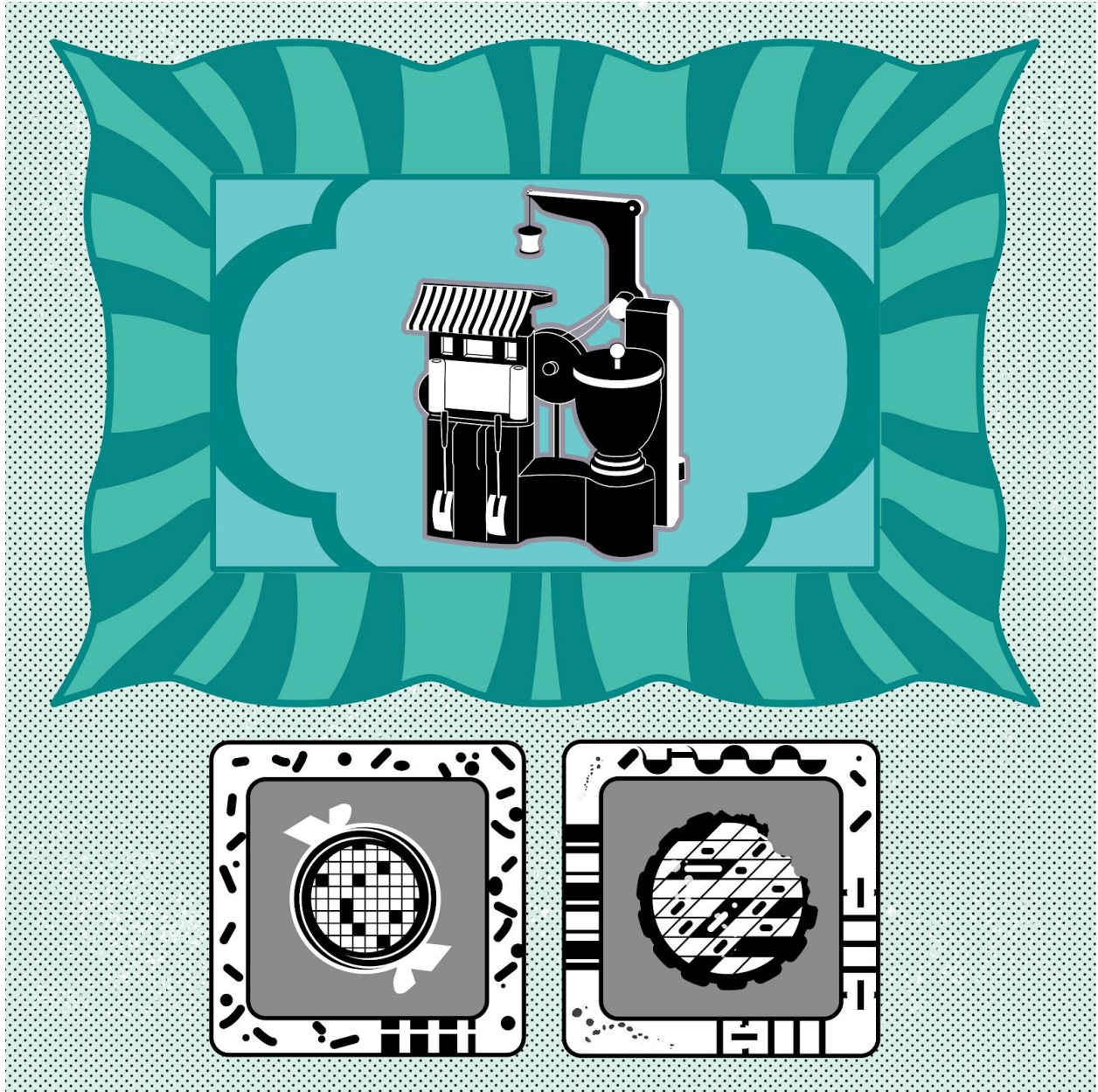
The Pages and Trackers:

Here, the user is introduced to the experience through an illustrated story book spread where they are given the backstory which sets the stage for the following interactions via AR. We implemented this interactive storybook to keep the immersive, playful, feel that we designed in the VR experience. Everything having to do with the storyline and theme was taken into account when designing all elements of the experience. The trackers were designed to look like hard candies, coffee mugs, and cookies, while the interface was designed with the same color scheme and textures used within the VR environment. We even played with the idea of using actual wrapped candies as game pieces for the activities.





This is a page from the AR portion of the book. The cookie tracker is positioned right underneath the large tracking graphic of the Task Station. This is so that when the user activates the AR, they can view the 3D model of the station while performing the interaction towards the bottom.



AR Updates:

- Visual cues for helping user to align phone with the page
- Better text block directions for guiding user through exp either with voice over or
- Very limited text blocks that user taps on to hide when done reading
- Audio- Background music and cue sounds to mark beginning, end, correct or incorrect during each activity