

DESN 22848
Media, Motion, and the Body

PROJECT 3

DESIGN FOR
LIVING SYSTEMS

April 17, 2023
Jade Guerin

Table of Content

Design Statement 03

Final Design 04

Design Reflection 06

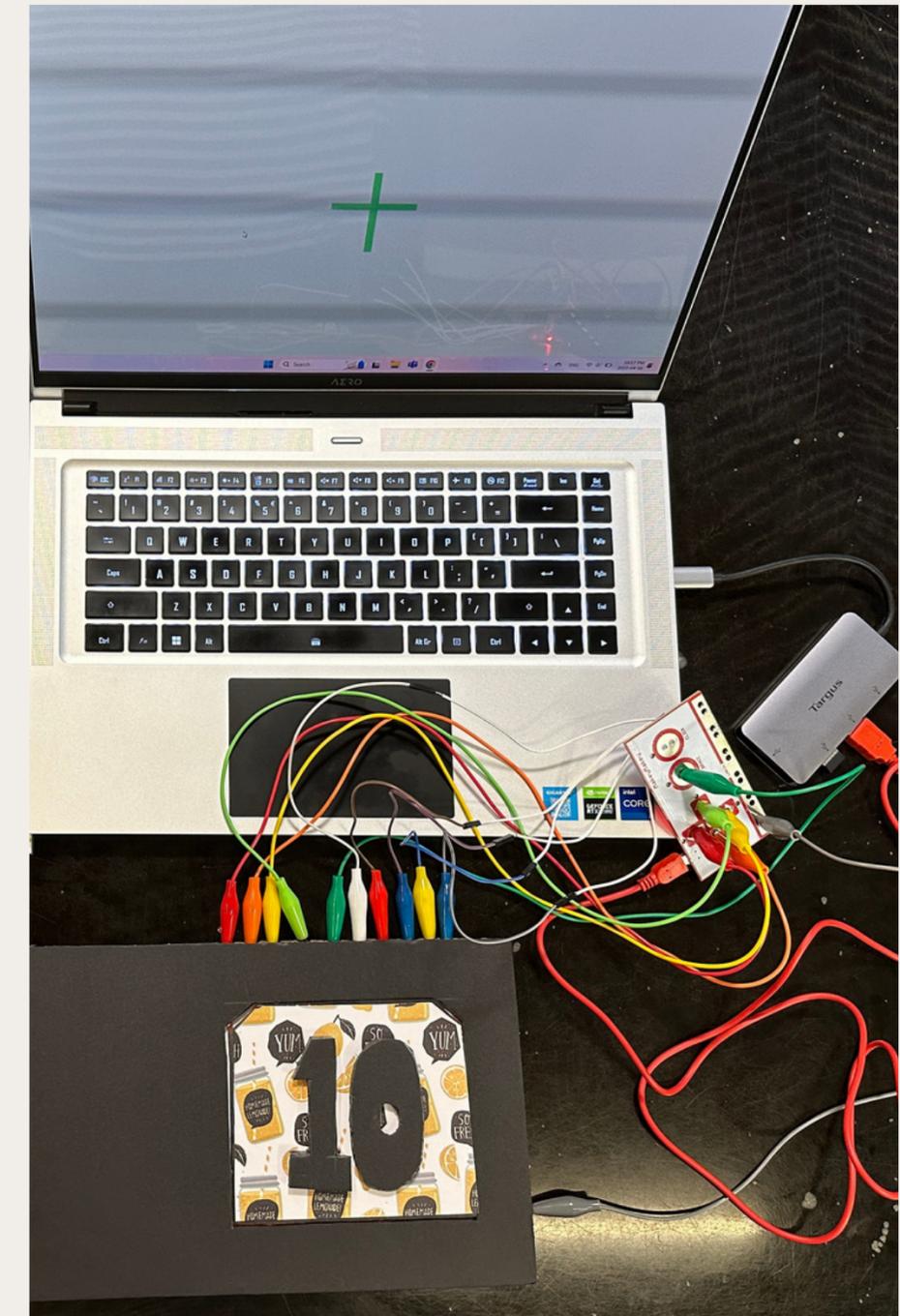
Inspirations 08

Design Process 09

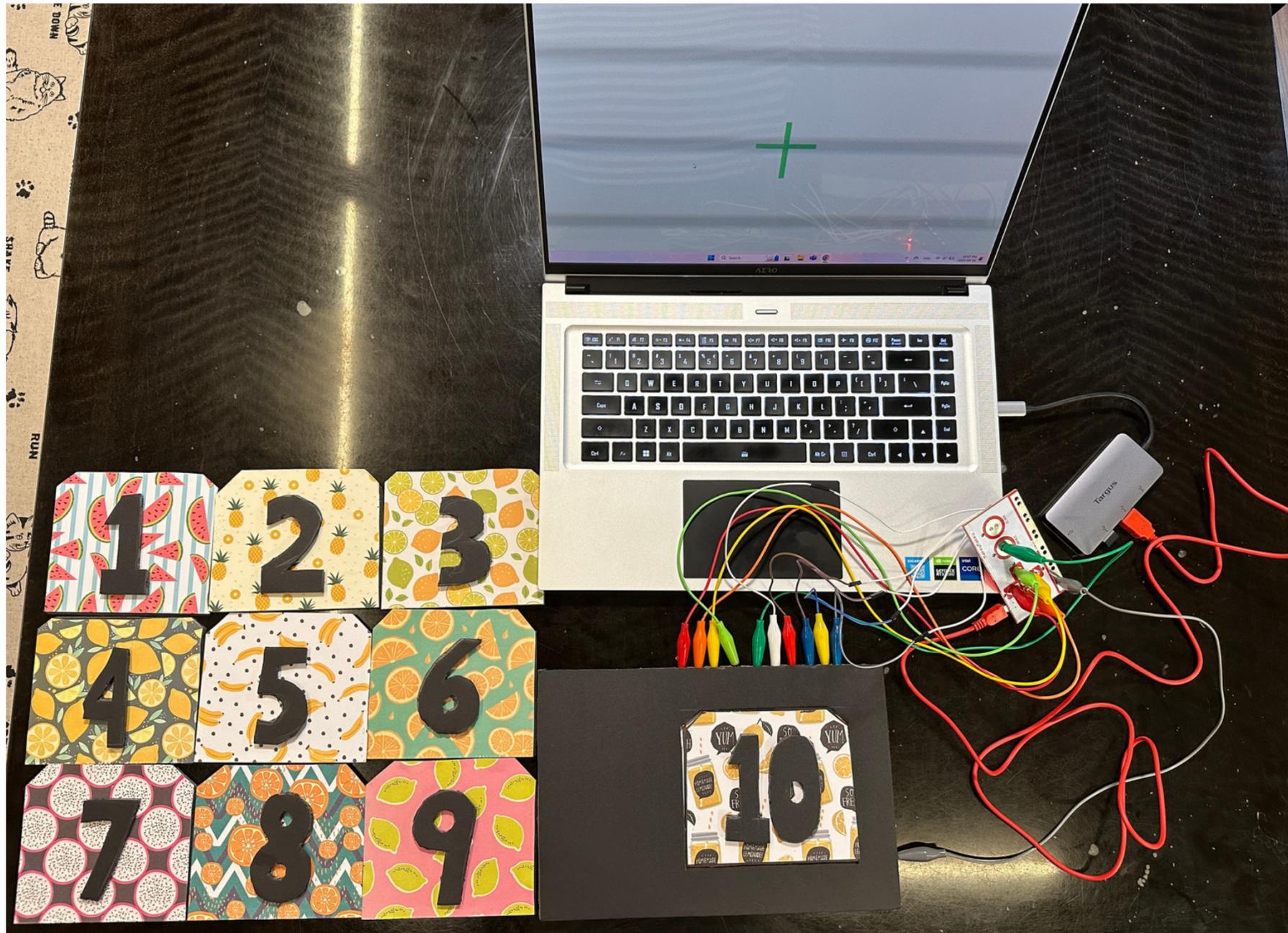
Citation 14

Design Statement

The objective of this project is to create an interactive and immersive learning tool for children that enhances their language learning experience by engaging multiple senses, more specifically, through touch as it provides a sensory experience that allows them to understand the world around them through tactile feedback. Inspired by the Leapfrog Fridge Phonics Magnetic Letter Set, the design utilizes haptic feedback to provide tactile knowledge of the physical shape and feel of the numbers, as well as feedback in the forms of auditory and visual knowledge of the number in Chinese. The low-voltage prototype uses copper tape, input methods connected to the Makey Makey and P5.js code, and number block plates that can be manipulated in different orders to experiment with Chinese numerals. Through touch and interaction, children can develop their Chinese comprehension and interest in learning other Chinese characters. The feedback provided through touch aims to help children learn and retain information more effectively by engaging multiple senses, such as sights, auditory, and touch. This prototype has the potential to be a versatile and effective tool for creating engaging and immersive learning experiences not only for children, but for a wide range of learners. It can be adapted for use in teaching subjects beyond Chinese numerals, including alphabets, shapes, and animals. Additionally, it can be modified to cater to visually impaired users who wish to learn Braille.



Final Design



Click [HERE](#) to watch the video showcasing the final prototype in action.

Instructions:



Step 1:

Connect the base of the prototype with the Makey Makey using the provided cables.

Step 2:

Connect the Makey Makey to a device (computer or tablet) using a USB cable.

Step 3:

Launch the P5.js code for the prototype software on the device.

Step 4:

Choose a numeral block plate and place it into the base of the prototype. The Makey Makey will send a signal to the device and trigger the corresponding audio and visual feedback on the screen.

Step 5:

Repeat the process and continue to explore with other numeral block plates to practice and learn more Chinese numbers.

Design Reflection

Project 3 was an ambitious combination of the skills and techniques learned in Project 1 and Project 2. By building on the techniques and ideas developed in Project 1, the design of Project 3 was able to integrate my Chinese culture into the design through the use of Chinese numerals. Meanwhile, Project 2's focus on sound visualization and provided a useful framework for the creation of a responsive and dynamic user experience for children to enhance their language learning experience.

While the combination of physical computing and web-based visualization was challenging, the project provided a valuable opportunity for learning and experimentation. The incorporation of haptic feedback and other senses helped to enhance the overall learning experience and offered a unique approach to language learning. Furthermore, the project's incorporation of Chinese culture helped to create a more meaningful and relevant experience for users, more specifically, my daughter who I designed this prototype for. The prototype uses haptic feedback to provide tactile knowledge of the physical shape and feel of the numbers, while also providing feedback in the forms of auditory and visual knowledge of the number in Chinese. Through touch and interaction, children can develop their Chinese comprehension and interest in learning other Chinese characters.

Project 3 was a result of all the experimentations conducted during the process of all three projects. It demonstrated the potential for combining different design and development techniques to create innovative and engaging interactive experiences that balanced the physical interaction with the digital manifestation while incorporating elements of Chinese culture. The project provided valuable insights into the importance of designing for multiple senses and incorporating cultural symbolism, while providing the experience to explore different mediums for design and create tangible prototypes that could enhance the learning experience of children.

How can it benefit children's learning?

Motor skills

The tactile feedback provided by the prototype could help children develop their motor skills by allowing them to practice manipulating physical objects. For example, picking up and placing the number block plates on the base could help children develop their hand-eye coordination and dexterity.

Language acquisition

The auditory and visual feedback provided by the prototype could aid in language acquisition by reinforcing the association between the written Chinese numerals and their corresponding pronunciation. For example, hearing the Chinese numeral pronounced while also seeing it on the screen could help children develop a stronger understanding of the relationship between written and spoken language.

Engagement

By combining tactile, auditory, and visual feedback, the prototype has the potential to be a highly engaging learning tool, especially since it can be further developed for other learning experiences. When children are engaged in the learning process, they are more likely to be motivated and retain what they have learned. This could help children develop a lifelong love of learning and improve their future academic success.

Cultural Understanding

This prototype could also help children develop a deeper understanding and appreciation for the Chinese culture. By learning Chinese numerals in a fun and engaging way, children may be more likely to want to continue learning about the Chinese culture through the Chinese language in the future.

Design Inspirations

Touch is a fundamental sense that children use to learn and explore their environment. As they interact with their surroundings, they collect sensory data that their brain processes and uses to form connections and learn about the world (Sanders). This tactile learning is especially important for a child's growth in physical abilities, cognitive and language skills, and problem-solving abilities, especially since touch is associated with enhanced learning, language processing, and improved problem solving (Hatfield).

This prototype was designed with my daughter in mind with inspiration from the Leapfrog Fridge Phonics Magnetic Letter Set that helps children learn about letters, letter sounds, and word recognition through interactive play. My daughter is half Chinese and currently learning Chinese, but she finds the content difficult and hard to digest from the online platform she is learning from. On the other hand, the Leapfrog toy is designed to have children connect the magnetic letters to the electronic base, where the base will respond with the corresponding letter sound and an associated word.

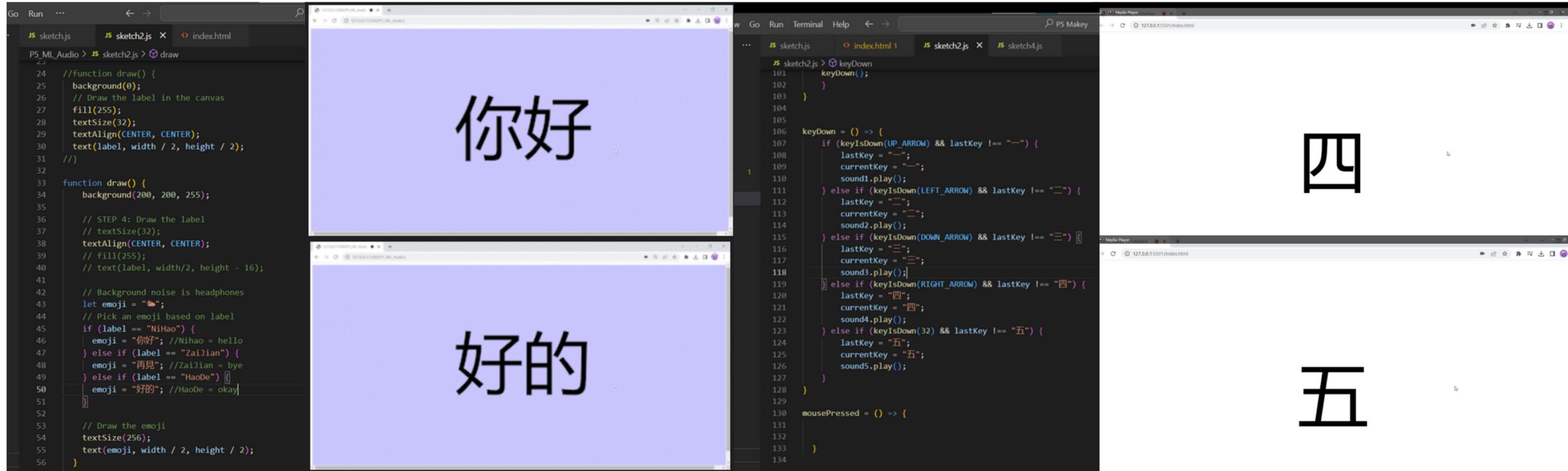
Hence, the goal was to create a fun and engaging learning experience that would utilize her natural sense of touch, similar to the Leapfrog toy experience, to make the learning process more enjoyable for her but in a more natural and effective way. The prototype created for this project uses haptic feedback to provide tactile knowledge of the physical shape and feel of Chinese numerals, as well as auditory and visual knowledge of the number in Chinese from the Makey Makey and P5.js code. By creating a prototype that combines tactile learning with auditory and visual feedback, I hope to provide an immersive and engaging learning experience that can help not only her enjoy learning Chinese, but hopefully for others to develop a lifelong love of learning.

Process



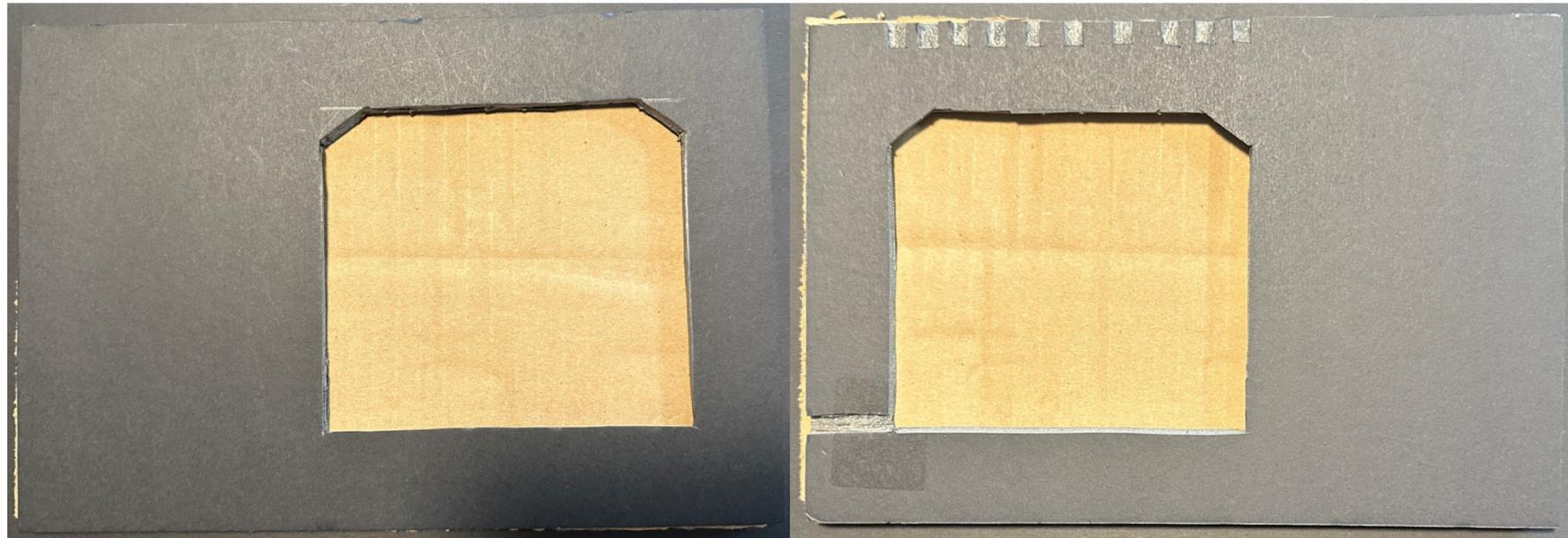
Activity 2 provided an opportunity to explore the use of a 5 button interaction with the Makey Makey in p5.js. This activity introduced the concept of using a 5 button constraint as a starting point for integrating the Makey Makey with P5 sketches. Through experimentation, different ways were explored to use the Makey Makey as a physical interface to create affordances. This led to the iterative design of two prototypes during activity 3: a baby animal mobile and a numbers matching game for kids to learn Chinese. The baby mobile prototype was inspired by the initial concept of strings of stars threaded by conductive threads, while the numbers matching game was influenced by the professor's critique of creating an interactive poster. The game utilized conductive tape rather than conductive thread. Both prototypes incorporated the use of the Makey Makey as a physical interface, providing visual and auditory feedback for the user's interaction. The number matching game's base features five incomplete circuits, with each card acting as a switch for a specific circuit. To prevent incorrect matches, each circuit includes broken circuits at different points.

Process



To improve the visual and auditory feedback for both the baby mobile and numbers matching game prototypes, I decided to draw inspiration from the code developed during the machine learning sketch file project. Specifically, I incorporated elements from an experiment where Chinese greetings were spoken into a microphone, which then displayed the corresponding Chinese characters on the screen. This approach proved effective for both prototypes, with the baby mobile displaying an image of the animal and its pronunciation when it touches the "ground," and the numbers matching game displaying the Chinese character and pronunciation for each correctly matched card. I would like to note that all audio files used in this project, including the pronunciations of the Chinese numbers and animal names, were created and produced by me. Developing the code for the prototype was a challenging process, particularly in regards to the audio playback. I encountered difficulties in preventing the audio from looping, and despite receiving assistance from ChatGPT, it was a time-consuming and iterative process to achieve the desired functionality.

Process



For the final prototype, the number matching game was expanded by taking inspiration from the Leapfrog toy. The goal was to create a versatile prototype that can be modified with interchangeable blocks that would fit into the base. The prototype was designed with the aim of allowing for easy modification by users. The block plate can be swapped with different images and the user can interact with them by launching the sketch files.

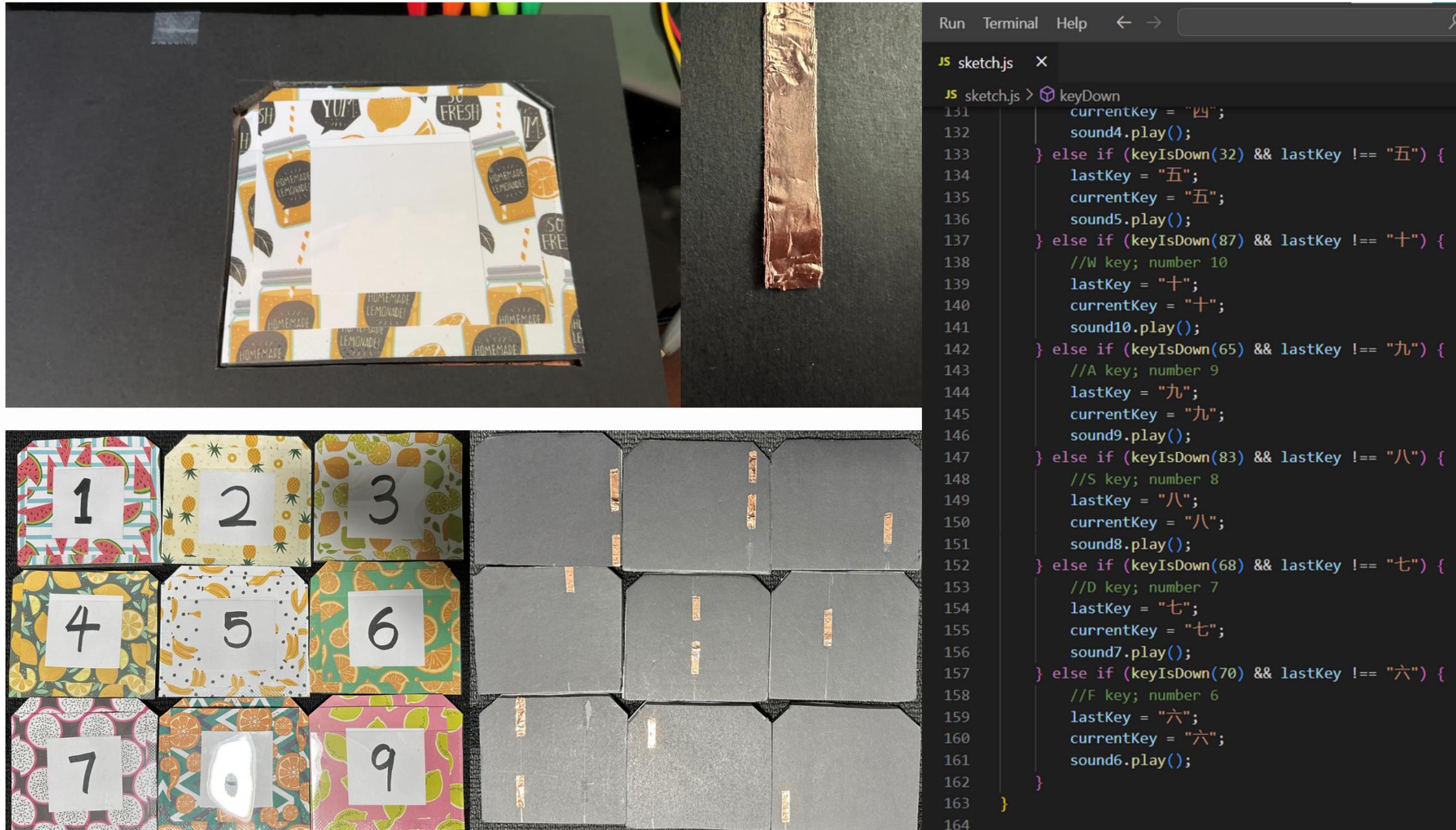
To accomplish this, a new base was created using the same concept as the numbers matching game, with 10 broken circuits made using conductive thread. However, due to a miscalculation of the size of the cutout, these circuits required modification

Design Process



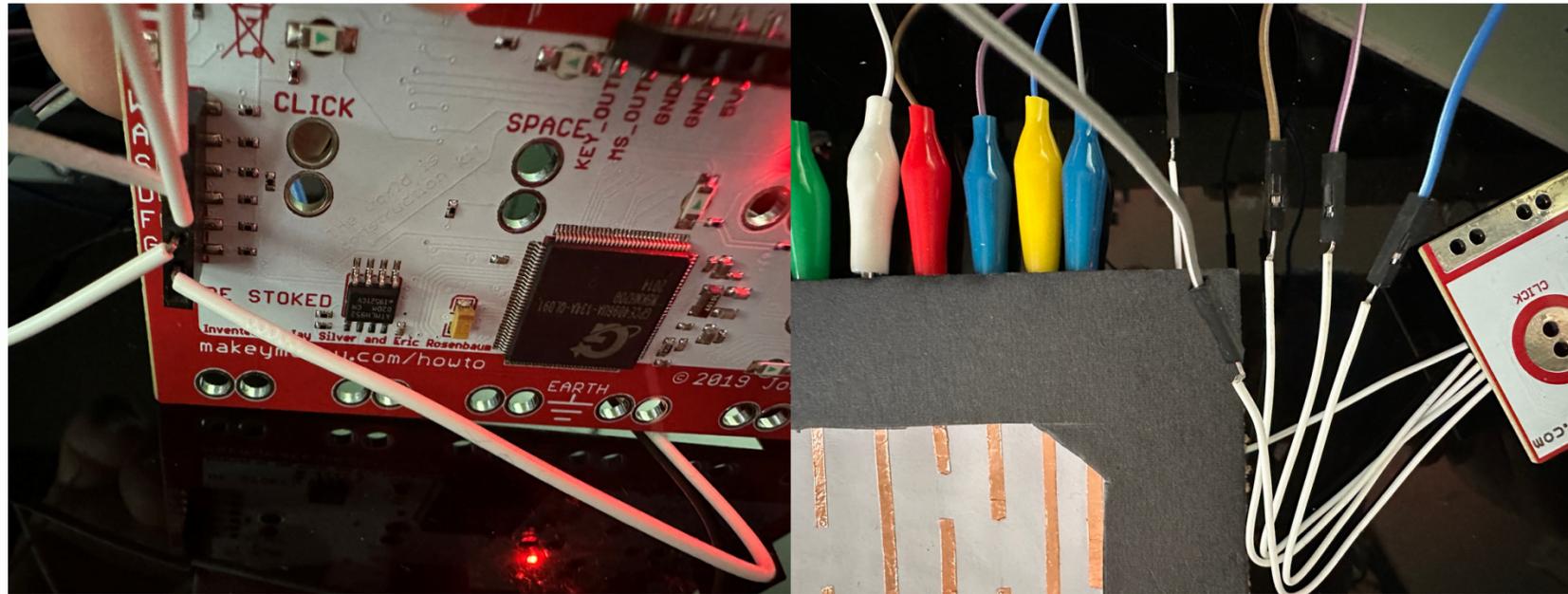
The focus then shifted towards designing individual block plates that would fit into the base, with the goal of creating a clear shape to indicate the proper orientation for insertion. The aim was to facilitate easy swapping of images for further development, to allow users to learn about different subjects by changing the cards and launching corresponding sketch files. This was achieved by adding a pocket for the card images. However, there was a concern about users potentially mixing up the images since each block plate acted as a switch that completed its own circuit. To address this, a color-coding system was implemented for both the block plate and the image cards to eliminate any confusion. Additionally, to make the system engaging and visually appealing for children, colorful and fun images were chosen for the color coding system.

Design Process



To ensure proper functionality, testing was conducted on each block plate, as they acted as switches for individualized circuits. However, during testing, it was discovered that the copper tape was too thin and did not produce a reliable connection. To resolve this issue, multiple layers were added to each plate. Additionally, the code was adjusted to include all 10 numbers and ChatGPT was consulted for assistance with WSADF key placement in the P5.js file. To allow for flexibility in future development of other learning experiences, the P5.js code was made for easy modification.

Design Process



Lastly, additional testing was performed to ensure the functionality of each plate. During previous tests, only the basic functions on the front of the Makey Makey were used. With the developed code including WSADF keys, everything was connected and tested. However, it was discovered that the prototype did not align with the project's main objective of generating knowledge through touch, which is a form of data that helps individuals understand the world. The current design lacked this aspect and only focused on fine motor skills. To create a tool that aids children in learning through touch, a flat plate would not suffice. As a result, all pockets were removed, and the image cards were replaced with cutouts of roman numeral numbers from 1 to 10. This design change not only retained the visual and auditory feedback but also provided a tactile learning experience for users.



Citation

Electronics Notes News & Comment. "What Is Haptics | Touchable Haptic Technology." YouTube, 16 Sept. 2016, www.youtube.com/watch?v=6lhQnWb44zk.

"Fridge Phonics Magnetic Letter Set." LeapFrog, store.leapfrog.com/en-us/store/p/fridge-phonics-magnetic-letter-set/_/A-prod19267. Accessed 17 Apr. 2023.

OpenAi. "Personal Communications." ChatGPT, 2023, chat.openai.com/.

"p5.js Examples." p5.js, <https://p5js.org/examples/>.

Sanders, Steve. "Stimulate Your Child's Sense of Touch." Primrose Schools, www.primroseschools.com/blog/stimulate-your-childs-sense-of-touch/#:~:text=The%20act%20of%20touching%20stimulates.

Villaneda, Alene. "WHAT IS TACTILE LEARNING? How Tactile Activities Improve Problem Solving & Language Processing - Integrated Learning Strategies." Integrated Learning Strategies, 11 May 2016, ilslearningcorner.com/2016-05-tactile-learning-how-your-child-learns-through-touch-and-their-tactile-system/.