FIRST INTERVIEW DOCUMENTATION

By Sylvia Ker and Zimeng Ma

Introduction

People

- Client: **Allie** (10 years old)
- Allie's caregivers: **Emily** (occupational therapist) and **Kristina** (speech therapist)
- Engineer/designers: Sylvia and Zimeng

Time

- September 25th, 2025 from 2:30 PM - 3:30 PM

Purpose

For our first meeting, we planned to get a general sense of Allie's abilities and limitations, her interests and daily life, and to overall get to know Allie and her caregivers. The overall goal is to create a device for Allie to increase her quality of life, through increasing independence, fun, and/or something else. This is for our Advanced Physical Computing (62-423) course at Carnegie Mellon University.

Meeting Agenda

Things to Bring

- LEGOs, pipe cleaners, marbles, phone with selfie filters, small selfie-stick, Annoying Toy (technical warmup project)

Photo Person

- Whoever is not talking is taking pictures! (Ask if we can put the camera on the side)

Technical Questions (involves Allie, parents, caregivers)

1. Can we see what devices/accommodations Allie uses? Can we get a demonstration/explanation?
2. We want to see Allie's full range of (comfortable) motion.
3. What is something that Allie/parents/caregivers wish existed to make Allie's life easier or more independent? (Fun or useful or both!) (Something cool for the bus, etc.)
4. Materials to build device: how large, 3d printed, laser cut stuff, fabrics?, weight?
5. What is Allie's day to day schedule?
6. What devices did they try but are not using because it's not as they expected or wasn't useful? And why?
7. What are some things Allie likes to do, but cannot (drawing, board games, etc)?

Fun/bonding Questions

1. What are her favorite songs?
    - ★ Do you like Taylor Swift? (Yes/No)
    - ★ Do you like Love Story or Cruel Summer?
    - ★ Take Selfies with Allie! (use fun filters)
    - ★ Do you like to take photos or sing?
2. Which type of pink do you like?

Meeting notes

- Does Allie have a side that's stronger?
    - She mainly uses her right hand.
- How does she interact with friends? What do they play?
    - They like listening to Taylor Swift together.
- Allie is able to speak 1~2 words.

Meeting Summary/Takeaways



Figure 1-3. Taking selfies with Allie

Summary

- We first toured the Children's Hospital and talked to Emily and Kristina about Allie, which included her interests, devices, and abilities. Then, we met Allie after her school ended and we were able to talk to Allie along with Emily on the side.
- We showed Allie the Annoying toy we made (on the bottom right corner of **figure 1** and **figure 3**), in which she was able to participate by pressing the button. However, she did not find much interest in it because she kept saying "All done" to indicate that she doesn't want to play with it anymore.
- We showed her the pipe cleaners, and Emily showed us Allie is able to relax her hand to hold the pipe cleaners with some help (Allie chose the orange one when given pink and orange).
- Allie and Emily were able to show us Allie's mobility (mainly motion in her right hand), and Emily told us about Allie's daily life. Unfortunately, Allie doesn't have any toys she can play independently with, which is something we could potentially design.

- For fun, we also listened with Allie to some Taylor Swift songs, and she really enjoyed “Cruel Summer” and “Anti-Hero” by Taylor Swift. Also, we took selfies with Allie and showed her some silly filters which made her laugh.

Findings

- Emily said Allie’s favorite color is pink, though Allie chose the orange pipe cleaner over the pink one, and Allie said her favorite color is green that day.
- Allie mainly uses her right hand, though she can slowly move both hands up, down, left, right approximately 5 inches each way.
- Allie’s daily life consists of: Home → Children’s Home → School → Children’s Home → Home.
- Emily noted that it would be nice if Allie has toys she can play with independently.
- Allie likes Taylor Swift and selfie filters.
- Allie can understand and respond to us using 1-2 words.
- Allie has multiple wheelchairs for many purposes. The wheelchair in which she can move independently is oftentimes only at school.
- Allie has a device at school where she can use her eyes to communicate (an eye gaze device). She uses this for learning purposes.
- Allie can use the annoying toy button super well.
- Allie is very responsive.

Reflection

Overall, we had different, though not opposing, initial thoughts, which are detailed below.

Sylvia

Although we had a lot less time with Allie and the caregivers than we expected, we were still able to get a lot of information. I had the expectation we would have a lot of time to sit down and discuss Allie with the caregivers with just Allie's team. However, that was done together with the other group (without laptops) and there was less time than expected, so we were not able to get all of our planned questions asked. If given a second chance, I would memorize my questions had I known we would not have access to our computers. Fortunately, though we did not get many planned questions answered, I got a lot of answers to questions that I did not plan. For example, that Allie does not have independent devices for play, or that Allie spends time with her friends by listening to music. The meeting was initially awkward at first because we didn't know each other well in the beginning. However, over time we warmed up to each other once we started playing music and taking selfies. Though we had questions unanswered, I think we got the most important ones answered given the people we met and the time we had. Additionally, I think the questions left unanswered can be well-answered by Allie's parents, who we will hopefully meet on Tuesday, 9/30.

Zimeng

The meeting mostly followed our plan, but we quickly realized the limits of our communication. Since Allie wasn't super familiar with us yet, and we don't have prior experience with children with cerebral palsy, many exchanges needed Emily's support and translation. The most difficult part, I think, is learning exactly her differences and figuring out how to transform it into something meaningful, so she can experience more at her age.

FIRST-ROUND PROTOTYPE DOCUMENTATION

By Sylvia Ker and Zimeng Ma

Introduction

People

- Client: **Allie** (10 years old)
- Allie's caregivers: **Emily** (occupational therapist) and **Kristina** (speech therapist)
- Engineer/designers: Sylvia and Zimeng

Time

- October 9th, 2025 from 2:30 PM - 3:30 PM

Purpose

The purpose of our second interview is to demonstrate multiple prototypes we created from our first meeting to Allie. The overall goal is to create a device for Allie to increase her quality of life, through increasing independence, fun, and/or something else. This is for our Advanced Physical Computing (62-423) course at Carnegie Mellon University.

Prototypes

1. Taylor Swift Music Player

- Software of Taylor Swift music and 3 accessible buttons for Allie to change music herself.



Figure 1. Allie and the Taylor Swift music player.

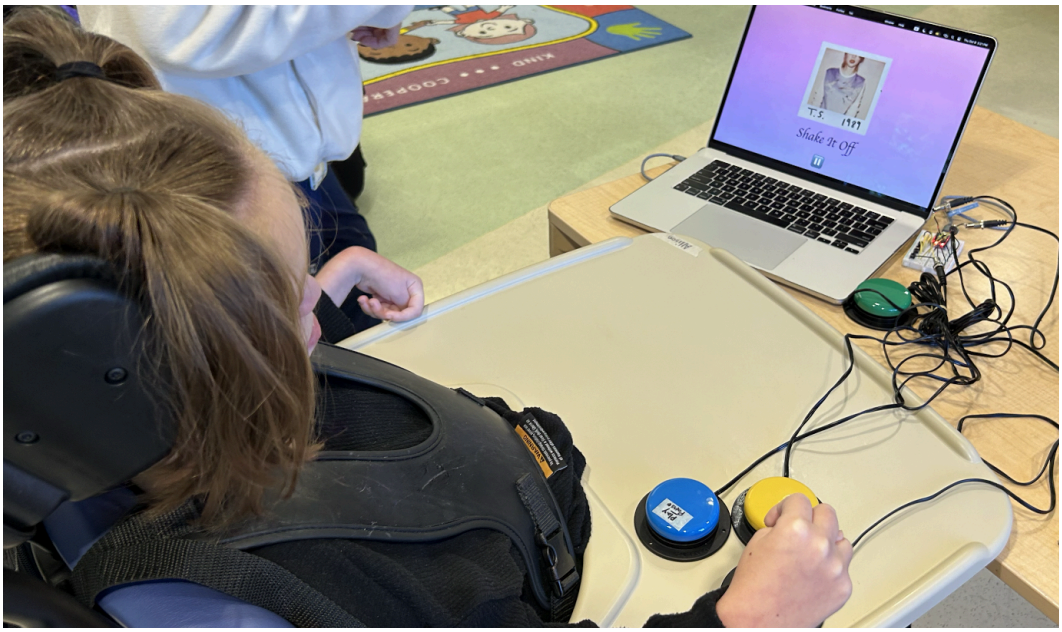


Figure 2. Allie using the Taylor Swift music player.

2. Ball Launcher

- Simple ball launcher with cardboard and balloon. When Allie presses the button, a person launches the ball to simulate the idea of the prototype.



Figure 3. Allie playing with the ball launcher with a caregiver.

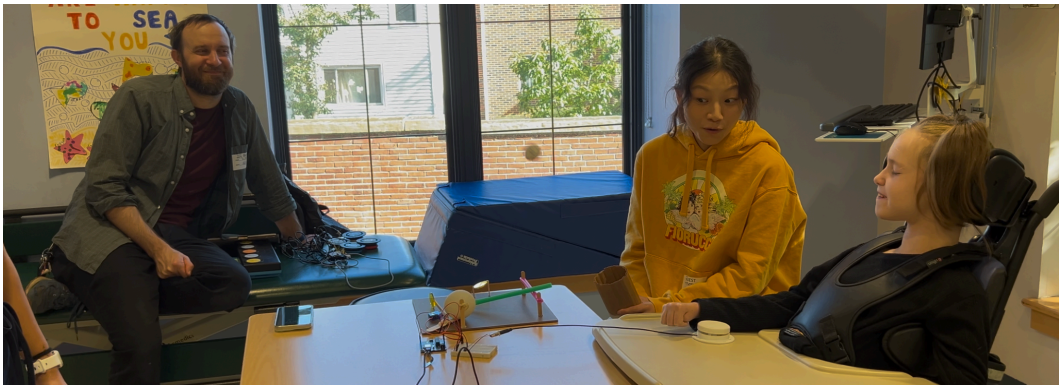


Figure 4. Closer shot of Allie playing with the ball launcher.

3. Physical Music Maker

- Motor along with multiple objects that make different noises when hit. Allie pressing a button activates the motor to repeatedly hit those objects and make noises.

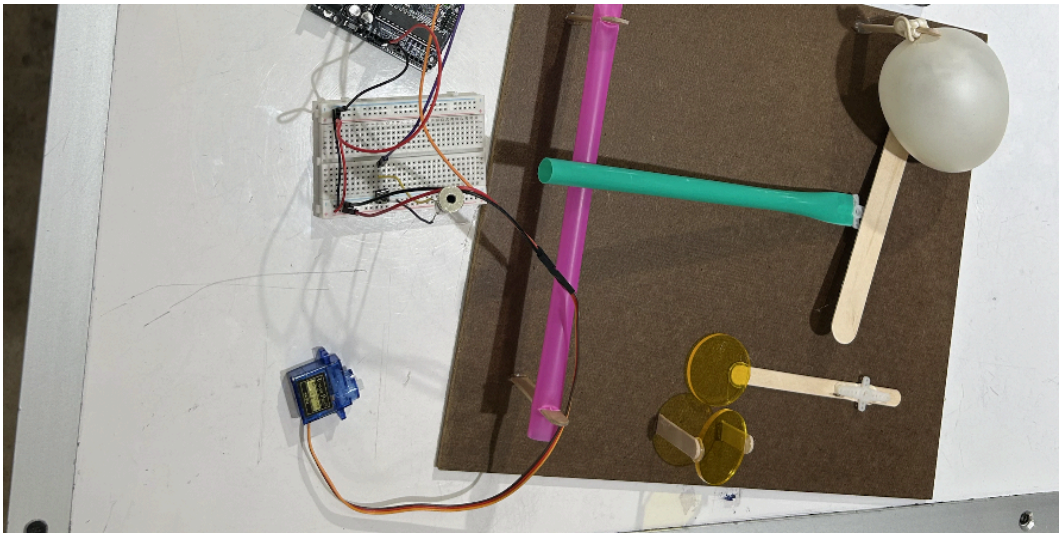


Figure 5. Prototype of physical music maker.



Figure 6. Allie trying out the physical music player.

4. Digital Piano

- Software of a simplified piano with three keys along with three buttons for Allie to play music by pressing down the buttons.

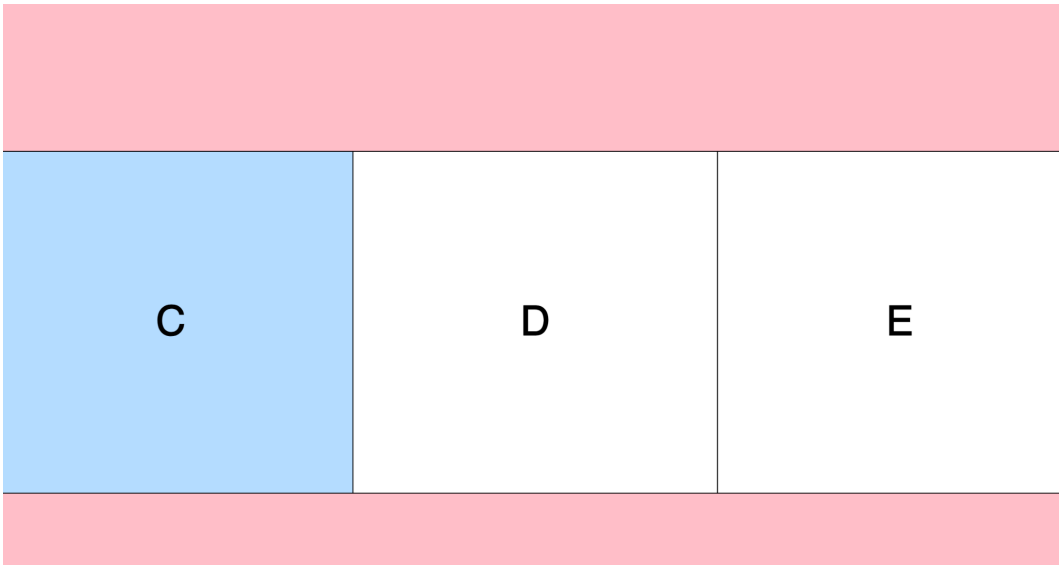


Figure 7. On-screen visual of Digital Piano.



Figure 8. Allie using the digital piano.

5. Communication Assistant

- Software of 4 buttons with “No”, “Yes”, “Maybe”, “Maybe Not” for Allie to be able to communicate with others with more ambiguous, rather than binary, answers.



Figure 9. On-screen visual of Communication Assistant.



Figure 8. Allie using the Communication Assistant.

Prototype Findings

Allie's Preferences (given a grade of out of 10 by inferring from Allie's reactions):

- Taylor Swift Music Player (9/10)
    - She kept wanting to go back to it.
- Ball Launcher (7/10)
    - She had fun while playing with her caregivers with it.
- Physical Music Maker (0/10)
    - She kept saying "no".
- Digital Piano (0/10)
    - She kept saying "no".
- Communication Assistant (0/10)
    - She kept saying "no".

Accessibility

All devices used buttons for her to access. The issue was the buttons were hard to reach in certain locations, but when held down to be stable and put in the right place for her, she can access it with no problem.



Figure 11. The buttons being close to Allie's right hand is best.

Meeting notes:

- Likes Taylor swift the most
- She likes ball launcher, but maybe bc of people
- Other 3 things she is disinterested

- Not sure if she's interested in the people or the device.
- Maybe it was because of the songs/people she's familiar with?
- Could use the buttons, but not with multiple ones (best with 2, maximum 3)
- Fav color: still green
- She's really good at quickly clicking a button, but it's hard for her to hold it down continuously to control something.
- About button position: maybe diagonal instead of horizontal? (she can move her arm frontwards and backwards better)

Reflection

Sylvia

The plan is to continue to prototype with the Taylor Swift music player. In the next meeting, we plan to give her multiple button locations all attached together to avoid the buttons moving around. Additionally, the multiple button locations will help test what works best for Allie. While I expected Allie to like the Taylor Swift music player the most, because we were told she likes Taylor Swift, I did not expect her to be so disinterested in the other three prototypes. I infer this probably is due to her seeing the Taylor Swift music player first, and thus causing so much disinterest in the others. If given another chance, I would give the prototypes in order of least interesting to most interesting, so that Allie would pay more interest in all of the prototypes. Our goal is to incorporate a game with the music player in future steps.

Zimeng

This time meeting Allie helped us understand her much better. During the process, we realized that sometimes when we were making our prototypes, we kind of forgot that she is just a ten-year-old girl. Some ideas that require learning or a bit of patience might not be so suitable for her — she loses interest fast and needs more guidance from familiar people. That made our prototype testing a bit difficult, but actually it's also a good thing, because we learned what really matters for her.

We started the session by playing Taylor Swift's music, which might have made Allie not so interested in trying anything else afterwards, haha. But anyway, that moment also showed us what she truly loves and connects with. For the next step, we plan to keep developing a Taylor-music-related device for her, but in a more fun and creative way, not just a simple music player.

SECOND-ROUND PROTOTYPE DOCUMENTATION

By Sylvia Ker and Zimeng Ma

Introduction

People

- Client: **Allie** (10 years old)
- Allie's caregivers: **Emily** (occupational therapist) and **Kristina** (speech therapist)
- Engineer/designers: Sylvia and Zimeng

Time

- November 6th, 2025 from 2:30 PM - 3:30 PM

Purpose

The purpose of this interview is for Allie to interact with our final prototype. This interview allows us to determine to what extent the prototype is appropriate for her abilities, and get feedback on what parts of the prototype need to be changed. This will help us understand how to make our device a more suitable and enjoyable experience for Allie. The overall goal is to create a device for Allie to increase her quality of life, through increasing independence, fun, and/or something else. This is for our Advanced Physical Computing (62-423) course at Carnegie Mellon University.

The Prototype

Questions to Answer

1. Are the buttons easily pressable for Allie?
2. Is the game speed of the device fun/helpful for Allie?
3. Are the lights visible to Allie?

Final Product of Allie's Device

Allie's device on the outside looks like a 3-keyed piano. On top of each key, there are LED lights of 3 different colors: red, green, and blue. The rule of the same is this: when the light turns on, Allie is given a time limit (adjustable) to press the button. If she is able to press the button within the time limit, the button plays Taylor Swift music. This game continues, in which Allie has to keep pressing the buttons in time in order to keep the music playing. This device allows Allie to listen to her favorite songs, while being a more interactive device.

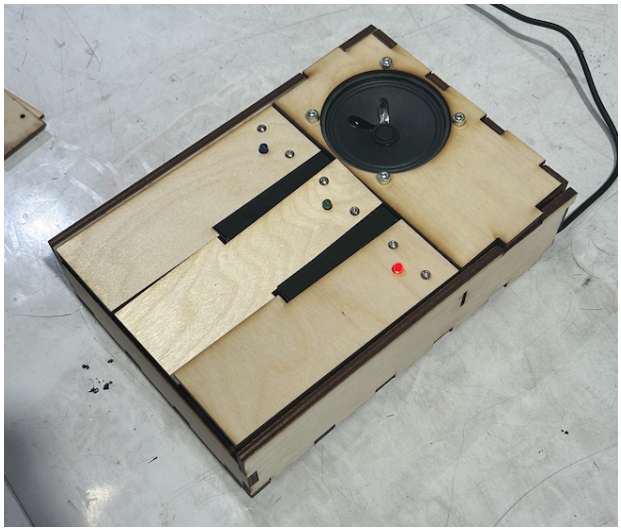


Figure 1. Prototype at Physical Computing Lab

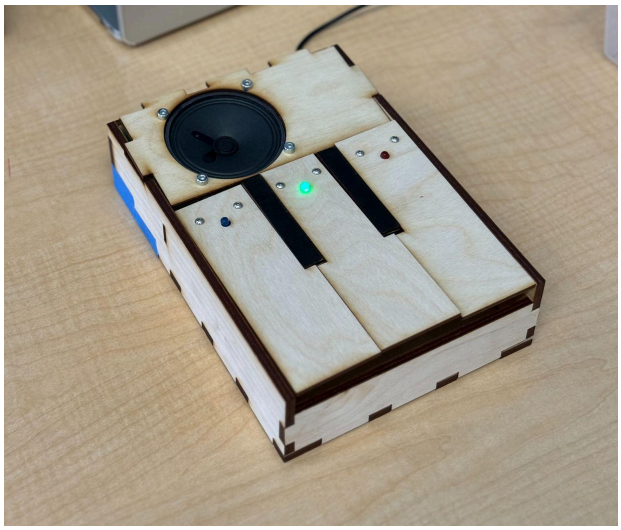


Figure 2. The final built version of the prototype at the Children's Hospital.

Design Process

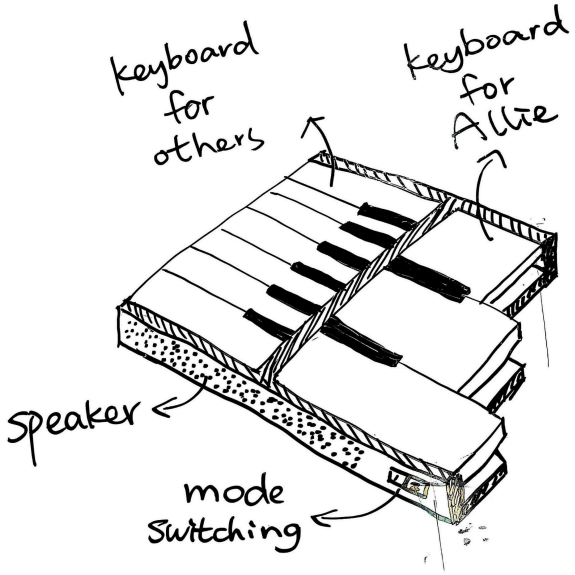


Figure 3. Sketch of the first prototype concept.*

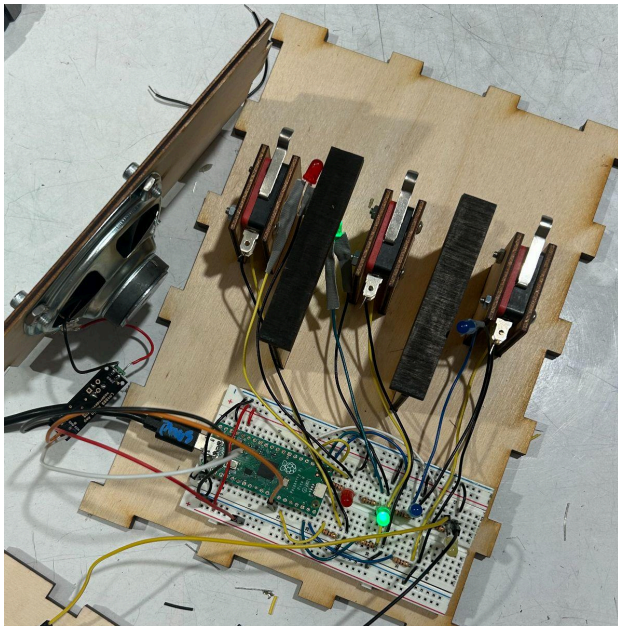


Figure 4. Electrical internals of the prototype.

*Because of the mechanical complexity and the lack of hinge pieces, we were not able to build the entire piano. For this stage, we focused on completing only Allie's side of the keys to test the usability and interaction.

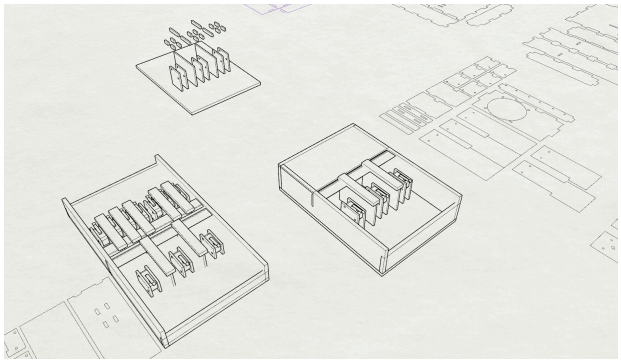


Figure 5. The digital model of the prototype.

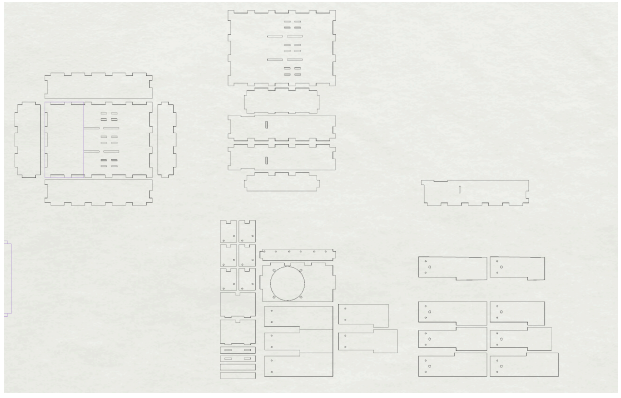
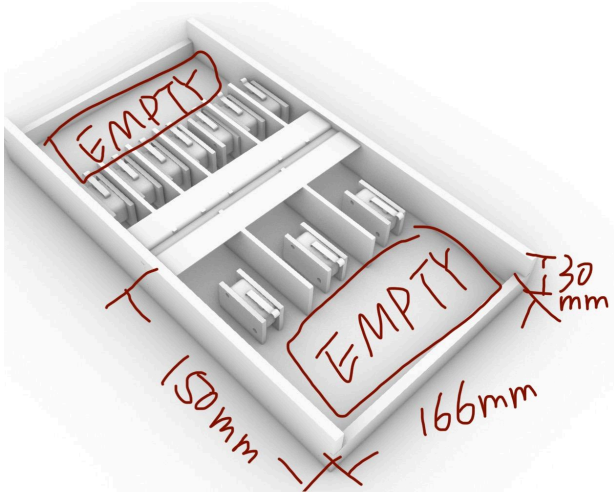


Figure 6. Laser-cut file layout for fabrication.



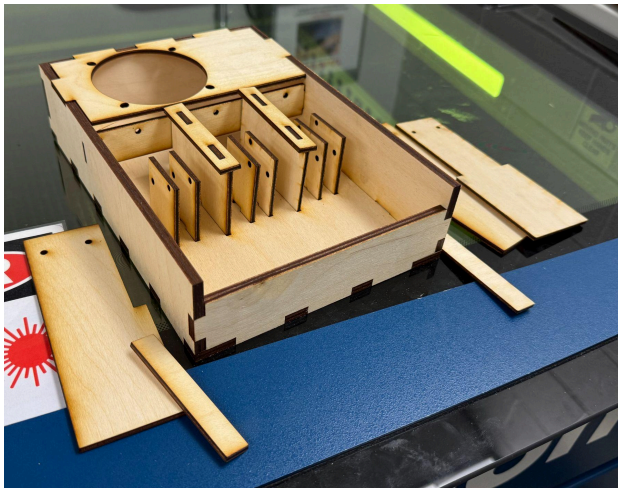
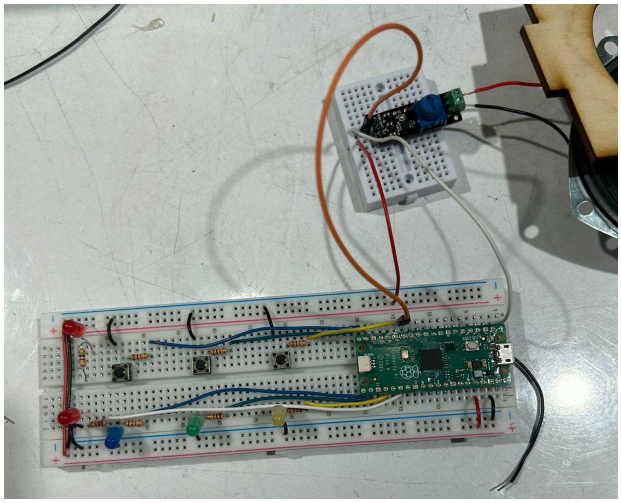


Figure 7. Device scale and dimensions.	Figure 8. Assembly of the laser-cut pieces.



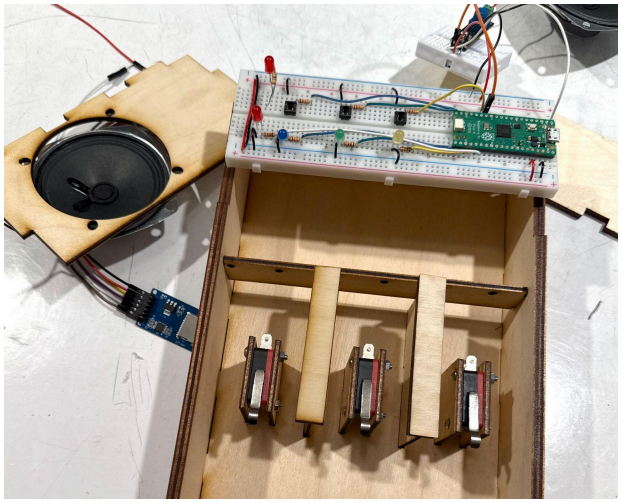


Figure 9. Circuit components.	Figure 10. Testing size of circuit components with physical design.

Prototype Findings

Finding to our questions:

1. Are the buttons easily pressable for Allie?

    a. While she enjoys the feeling of clicking the button, the following changes should be made:
        i. Wider Keys
        ii. Larger space between the keys
        iii. Solid block between the keys
        iv. Bi-directional keys (hit both up and down)
2. Is the game speed of the device fun/helpful for Allie?
    a. We initially had it at 3 seconds, but later changed it to 10 seconds, which seemed best to Allie.
3. Are the lights visible to Allie?
    a. The staff recommended bigger LED lights for Allie to see.




Figure 11 & 12. Allie having fun playing with her device.

Videos from Meeting videos

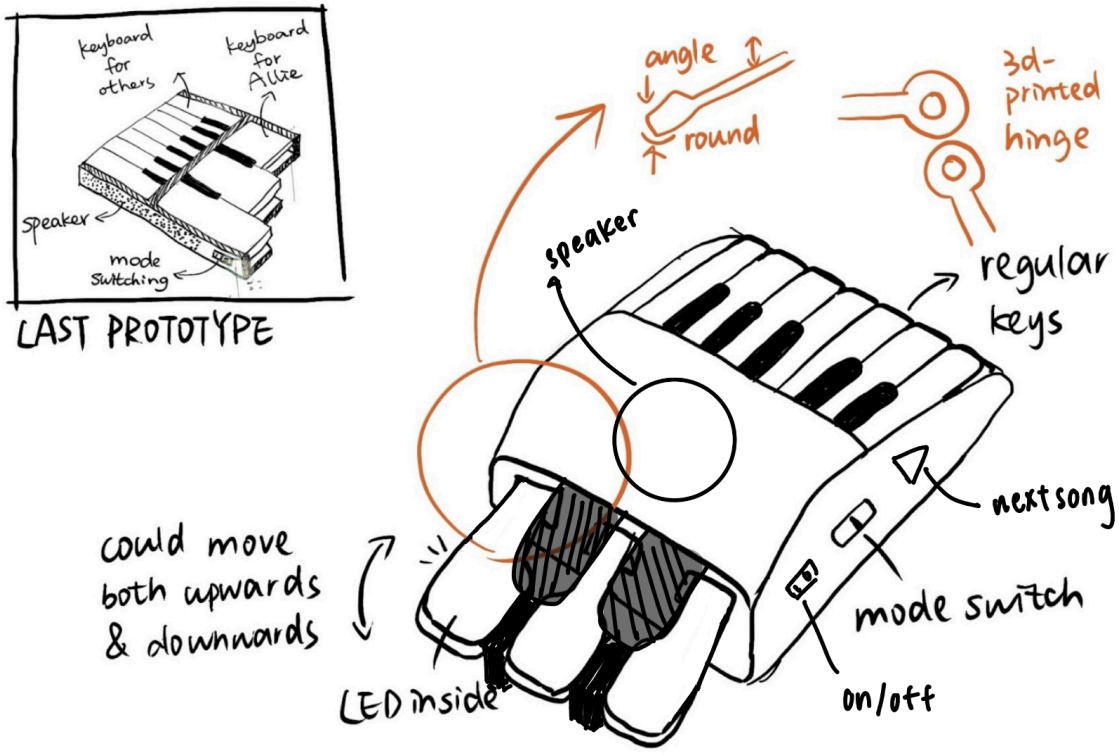
Meeting Notes

- bigger LED lights, the lights should be higher (it might be out of her vision)
- duration needs to be longer
- more space between the keys, make it hard for her to hit two at the same time
- wider keys
- solid block between keys (dark color to be more clear)
- she wants to hit it upwards (both down and up)
- reminder: clean versions of songs

Moving on to the Final Build

Something we had planned to test at the meet up was to see how long the buttons should light up before the music stops. At the meeting, we were able to adjust the second duration to be appropriate for Allie (10 seconds). Some feedback that we got was that it would be helpful to have more space between the keys, have larger keys, to have a physical block between the keys, and to make the lights more obvious. Another thing that needs significant change is to make the keys be pressable both up and down.

Figure 13. Sketch of our final design.



The keys are scaled to be larger, and there will be space between the keys along with a divider separating each key. Additionally, the material will be with translucent acrylic that will make the keys lighting up more visible for Allie. Additionally, the keys will be able to be pressed both up and down. The keys for Allie will also be more rounded to avoid Allie's hand from scratching the keys, since her hand movements are not always controlled. We plan to 3D print the whole key

and hinge structure so that it is more integrated. This should reduce mechanical error and make the key movement more stable. Finally, the device will have two modes. One is solo player, where only Allie’s side lights up, and the other is two-player, in which both Allie’s side and the other side lights up. (One side lights up at a time randomly).