

Hands-On Health

Educational tools to teach children with visual impairments about anatomy in the context of sexual health

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Abstract:

Hands-on Health kits are a set of “press-and-play” educational tools created to teach children with visual impairments between the age of 12 and 14 about anatomy and physiology in the context of sexual health and well-being. Understanding how your body works is an important step in feeling safe and comfortable about the changes that bodies go through during adolescence. Since it is not possible to use images, diagrams and other visual aids while teaching children with visual impairments, it is important that they get a sense of space about the internal anatomy through the learning experience created by these tools. This is why the Hands-on Health tools provide a set of organ-shaped puzzle pieces to be assembled in their appropriate place with the help of a guided audio and tactile interface. This project was completed in collaboration with Jnana Prabodhini’s Institute of Psychology in Pune City, India, as a part of their “Olakh Sparshachi”(Introduction to Touch) movement. This movement helps children between the ages of 7 and 14 to learn and understand sexual health, privacy, adolescence, reproduction, sexual abuse, consent, and safety.

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Concept

As a designer, I believe it is our responsibility to create and implement systems and solutions that are accessible to all users, regardless of their physical or cognitive abilities and needs. That is why, when my mother, who is a part of Jnana Prabodhini's Institute of Psychology, approached me for help to extend their Olakh Sparshachi (Introduction to touch) program to children with blindness or low vision, I took particular interest in it. With her request in mind, I am developing adaptive and accessible tools that focus on learning anatomy and physiology using tactility and audio for these children based on the curriculum of the program.



Fig. 0: Hands-on Health Kits

1. Introduction

In India, 53% of the population of children have been subjected to sexual abuse, according to a Government commissioned survey by Carson, Foster & Tripathi (2013)¹, which shows that child sexual abuse is a serious problem in India along with several other countries in the world. This child sexual abuse leads to poor physical, behavioural, social, and mental health, creating an urgent need for culturally tailored prevention and intervention measures. It is important to create emotionally safe and secure environments for children to grow up in. Increasing incidences of child sexual abuse are posing a threat to the such safety among children all over the world².

In India, there is a greater probability of a child getting victimized due to their socio-economic status. There are a lot of taboos, stigma and superstitions around conversations regarding sexual health. It is important that in such communities children know how to notice and address these taboos, understand different types of human relationships and what it means when someone is behaving inappropriately towards them and how they can seek the appropriate help.

Having access to social media, the internet and the news gives a very obvious overview of this problem. This is why, when I got the opportunity to contribute to the Olakh Sparshachi movement, I decided to dive in and make an impact however I could.

2. About the “Olakh Sparshachi” Movement

A pilot program started in 2014 by Jnana Prabodhini’s Institute of Psychology and women’s wing ‘Stree Shakti Prabodhan- Samvadini’ to make children aware of safeguarding oneself from abuse evolved into a bigger movement called “Olakh Sparshachi” (Introduction To Touch), considering the profound need of larger awareness. They developed training for teachers, volunteers, and educators to attain mastery over content related to sexual health and good touch, bad touch, as well as skills to inculcate

¹ D. K. Carson, J. M. Foster & N. Tripathi, Child sexual abuse in India: current issues and research (Psychological Studies, 2013, 58(3), 318-325.)

²Choudhary, V., et al. “Development of a multi-dimensional scale to measure trauma associated with child sexual abuse (MSCSA) and its ramifying impacts on children: A pilot study.” Asian journal of psychiatry, no. 31, 2018, pp. 27-35.

this awareness among children between ages 7 to 12 years. This training consists of age appropriate activities and graded informational inputs and exercises. It includes highly interactive, playful yet scientific methods like storytelling, interactive activities or games or pop-up books. Sessions are then conducted in different schools across Pune, a city in the west of India, especially in low income or underdeveloped communities.

To provide age appropriate content, the age groups are divided based on Stages of Child Development as per Erik Erikson's model³ (years 7-8; 8-9; 9-10; 11; 12). The common topics covered for these age groups include -

- Understanding one's body and privacy in that context
- Difference between good touch and bad (inappropriate) touch
- Responding to inappropriate behavior (saying no, informing an adult)
- Child helpline number along with a short film about it (the Protection of Children from Sexual Offenses (POSCO) Act in India)

Ages 11 and 12 have additional content about adolescence which includes -

- Anatomical and psychological changes
- Reproductive organ and their functions
- Psychological changes, moods, hormones, attraction

The next phase of this movement is a 360 degree approach that aims to incorporate more topics related to online sexual abuse, misconceptions around these topics and also include adults that come in regular contact with the children like parents, teachers, school workers, etc. in the process of spreading awareness on the subject and creating a safe and secure environment. They also intend to target schools for children with different learning needs, for example, schools for low vision, blind, deaf, cognitive impairments, etc.

³ Erikson, Erik. n.d. *Childhood and Society*. 2nd ed. 1963, New York: Norton

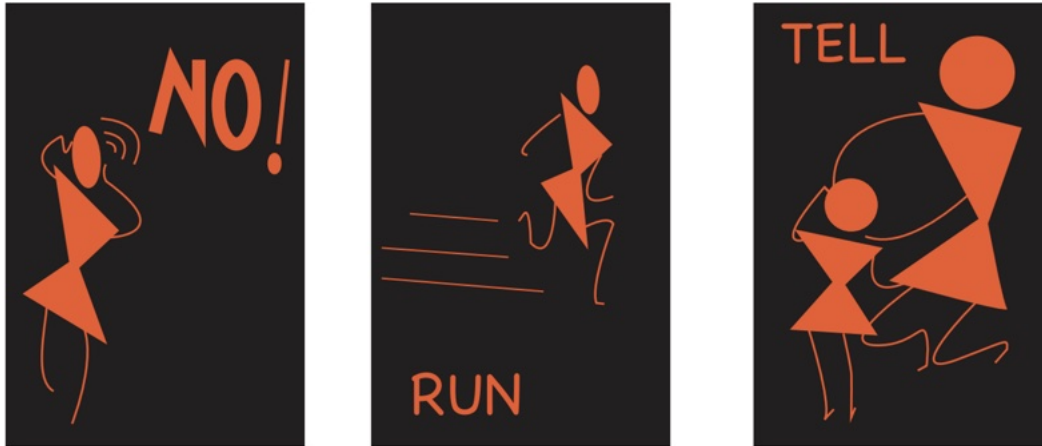


Fig. 2.1: Example of content: How to respond to improper behavior by an adult?



Fig. 2.2: Komal's story, a video to highlight the child line number

2.1. Initial Insights on the Program

During my first research interview⁴ with my mother to understand more about the program, I discovered that one of the most important considerations of this program is to be able to communicate complicated and difficult concepts without generating fear in the minds of the children about all the people around them but still remind them to be cautious and reach out to trusted adults in case of any problems. The language is designed so that it doesn't name specific relationships but keeps it general and open to make sure children understand that it is inappropriate for **ANY** adult to misbehave with them.

⁴ Deshpande, Shamangi. 2022. Interview about the program. India.

Another important consideration was that the trainers and teachers often work with limited resources. For example, it is possible that they may not have access to projectors, laptops or electricity in the schools.

The cultural context they are situated in plays an important role in determining how and what content is delivered. For example, the program currently only speaks about male and female anatomies and biology. The children are also taught separately based on their genders. The program does not dive specifically into gender identities and different types of sexual orientations. This is because culturally, the audiences are not aware and haven't developed enough acceptance and understanding of these different conversations and being able to talk openly about sexual health itself is a big step.

I also looked into Erik Erikson's (1963)⁵ proposed stages of psychosocial development where in each stage an individual goes through a psychological crisis which has some negative or positive outcome for that individual. These crises occur due to the conflict between psychological needs of the individual and the needs of the society. Based on these stages of child development, the way to communicate with the children at different ages is different.

2.2. Discoveries/Needs Identified

Some of the initial needs I identified through this research were:

1. Adding anchoring activities to the content to help recall and remembering
2. Assessments
3. Relatable and familiar games modified to deliver information

2.3. Precedents

In 2017, Charlotte⁶, a student from France, developed some activity books for elementary school children to be used in the Introduction to Touch program.

⁵ Erikson, Erik. *Childhood and Society*, 1963, 2nd ed. New York: Norton.

⁶ Charlotte. *Activity books for elementary school children*. 2017. India.

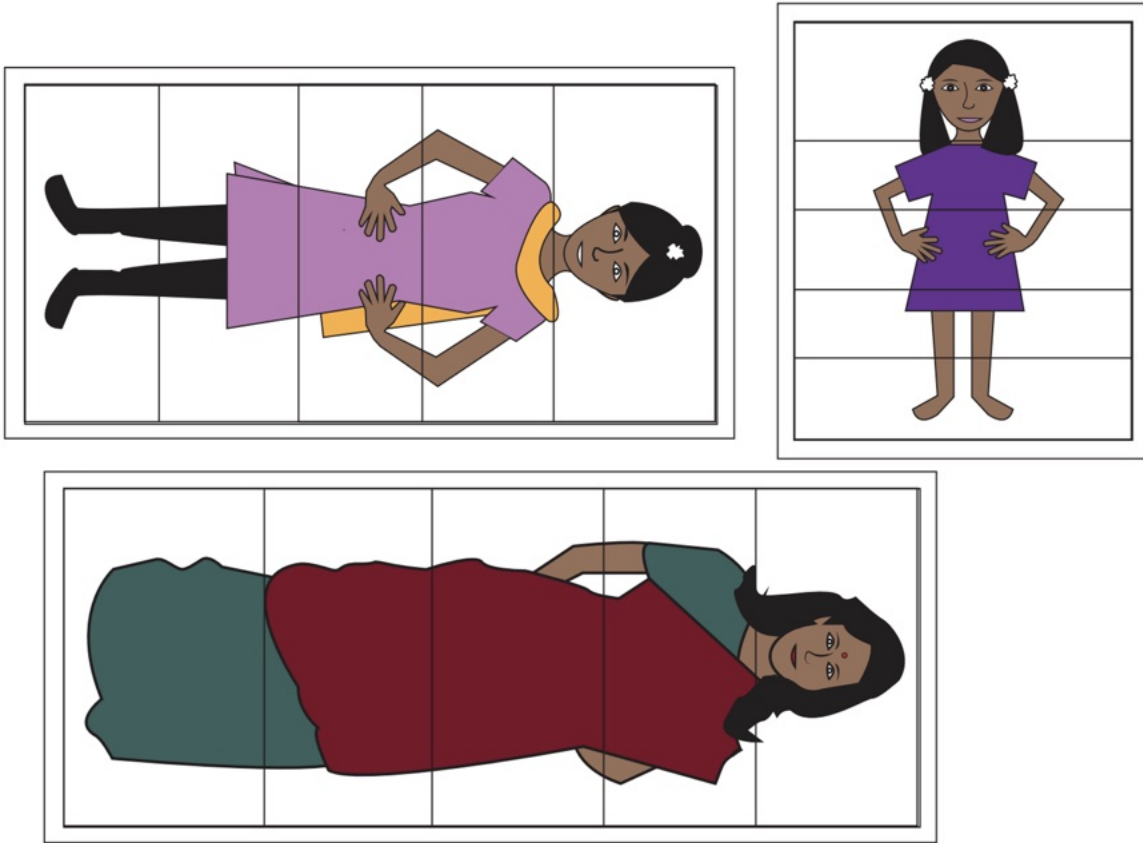


Fig. 2.3.1: Changing bodies activity designed by Charlotte

“Talking About Reproductive and Sexual Health Issues” (TARSHI)⁷ in New Delhi developed 2 handbooks for students from ages 10-14 and ages 15+ which talk about the changes in one’s body, what media may or may not display, health, and doubts that children may face.

⁷ “Talking About Reproductive and Sexual Health Issues.” n.d. Accessed October, 2022.

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Fig. 2.3.2: Contents of the TARSHI handbook

I found a book on Teachers Pay Teachers, by Health is Elementary⁸, that talks about the “underwear/swimsuit rule” as a great and effective way to explain body privacy and good touch bad touch.

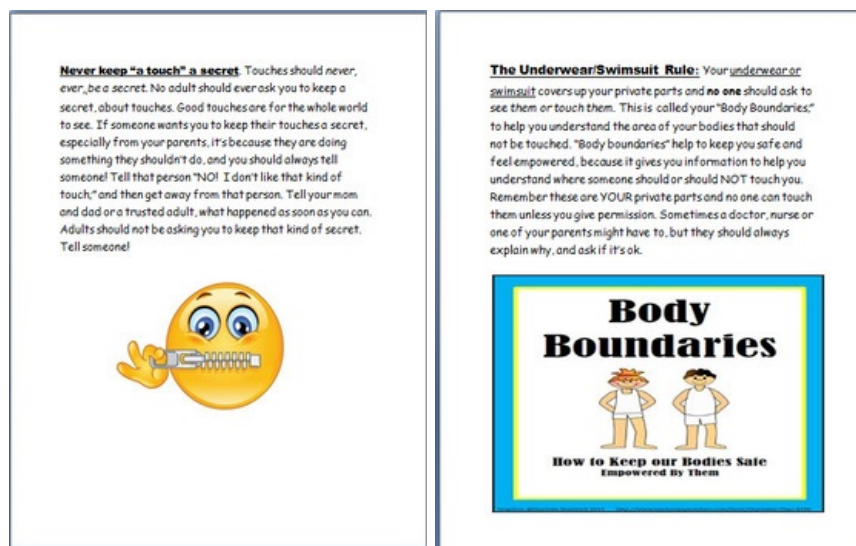


Fig. 2.3.3: Underwear/ swimsuit rule

⁸ Good Touch-Bad Touch -"Underwear, Swimsuit Rule" CDC Health Standard Four. n.d. N.p.: Health is Elementary.

A former Design and Technology student, Yumeng Gao, in their thesis project, “Let’s Chat”⁹, designed a set of cards to help parents have difficult conversations regarding prevention of sexual abuse with their children.

There are many games available online that have simple interactions explaining inappropriate touches like “The Good Touch” on TinyTap¹⁰, that uses animal illustrations and simple scenarios to separate good and bad touch. There is also a list of SexEd games on SexEd Project which is art-inspired community-based US sex education. Lulu Lab, a game studio, has worked on multiple situational choice based games to teach about menstrual health or good touch bad touch.

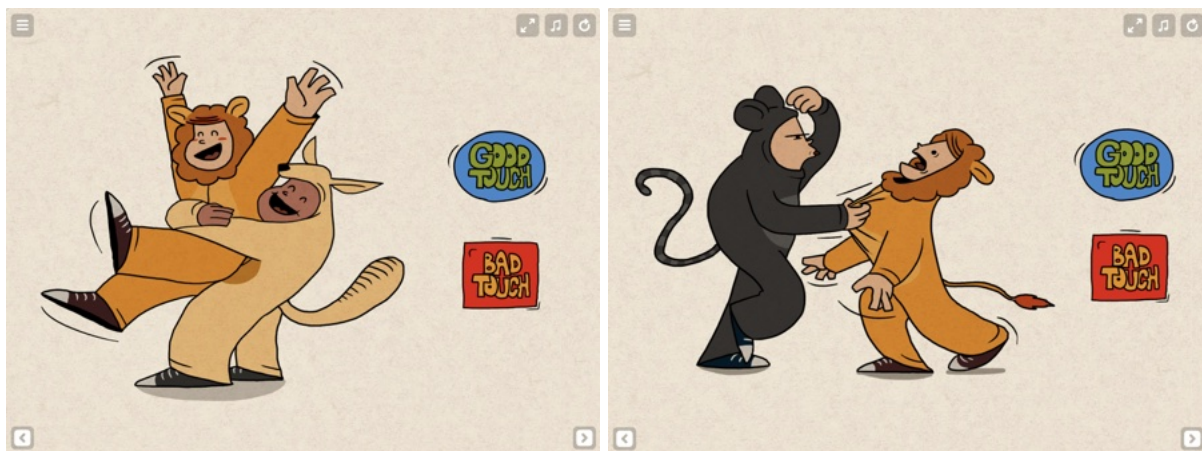


Fig. 2.3.4: Snippets from The Good Touch - TinyTap game

Some other websites with games around a social cause are Games4Change, Connected Camps and Filament Games.

3. Initial Prototypes/ Making as Research

I started making prototypes as a way to brainstorm ideas, understand problem spaces and find different possibilities for intervention. This part of the process focused on “making as research”. It was

⁹ Gao, Yumeng. n.d. Let's Chat.

¹⁰ “Educational Games and Interactive Lessons.” n.d. TinyTap. Accessed October, 2022. <https://www.tinytap.com/content/>.

important to explore different simple and complicated ideas early on to get a sense of my own role and capabilities and define how I could contribute to the program.

3.1. Interviews with John, Kyle and Colleen

I spoke to John Sharp, Colleen Macklin and Kyle Li¹¹ on their suggestions, inputs and experience designing playful experiences for social impact or education. The most common advice that came out of these conversations was that I needed to narrow down my scope for every prototype as much as I can, especially the age and sub-topics. Colleen suggested decentralizing the children from the active role and trying to approach the conversations that puts the children in a third person point of view. An example she gave was about her work with the US Holocaust Memorial Museum where they created a texting-based interactive game while maintaining the sensitivity of the subject. John also recommended adapting to the existing curriculum as the first step to prototyping since I already have all the context. Kyle also mentioned how educational games need to be facilitated by discussions (before/ after) by the teachers/ parents, and can not be as effective to introduce completely new ideas. Another important takeaway for me was to understand the children's lives outside of school including their interactions with their parents or other family members, friends, activities that they do and so on. Some of the key points out of these conversations were-

- Engage children into the experience without making them a part of something traumatic
- Games as a medium of teaching need to be used to facilitate discussions or reinforce the curriculum
- A key step would be understanding their day to day environments, activities outside of the school as well, spaces and interactions
- Activities need to be quick paced to retain attention and need to have transferability
- Defining a very specific target group and topic as well as starting the prototypes using the current curriculum

These comments helped me in defining an approach which maintains all these considerations.

¹¹ Sharp, John, Colleen Macklin, and Kyle Li. 2022. New York.

3.2. 3D Printing

During my conversations with my mother, she had mentioned that there were no 3D anatomy models available that could be used to teach children. As a way to understand the scope of tools and fabrication methods, I decided to 3D print a basic model of a female reproductive system.



Fig. 3.2.1: 3D printed model of a female reproductive system

This by itself wouldn't have served any use. So, to take this a step further, I thought about the function of a physical prototype and potentially using it as an interactive controller to teach. A simple way I tested this was using conductive tapes and building out a scene in Unity to trigger an interaction. Although the test wasn't very successful, I believed that there would be a better purpose to serve for a physical prototype than being discarded.

3.3. Conceptual

I thought about the way content and stories were being delivered and tried to prototype different ways for the children to interact with it. For one of my experiments, I created a Twine story based on the story of Komal which is the video story to spread awareness about the Child Line number.

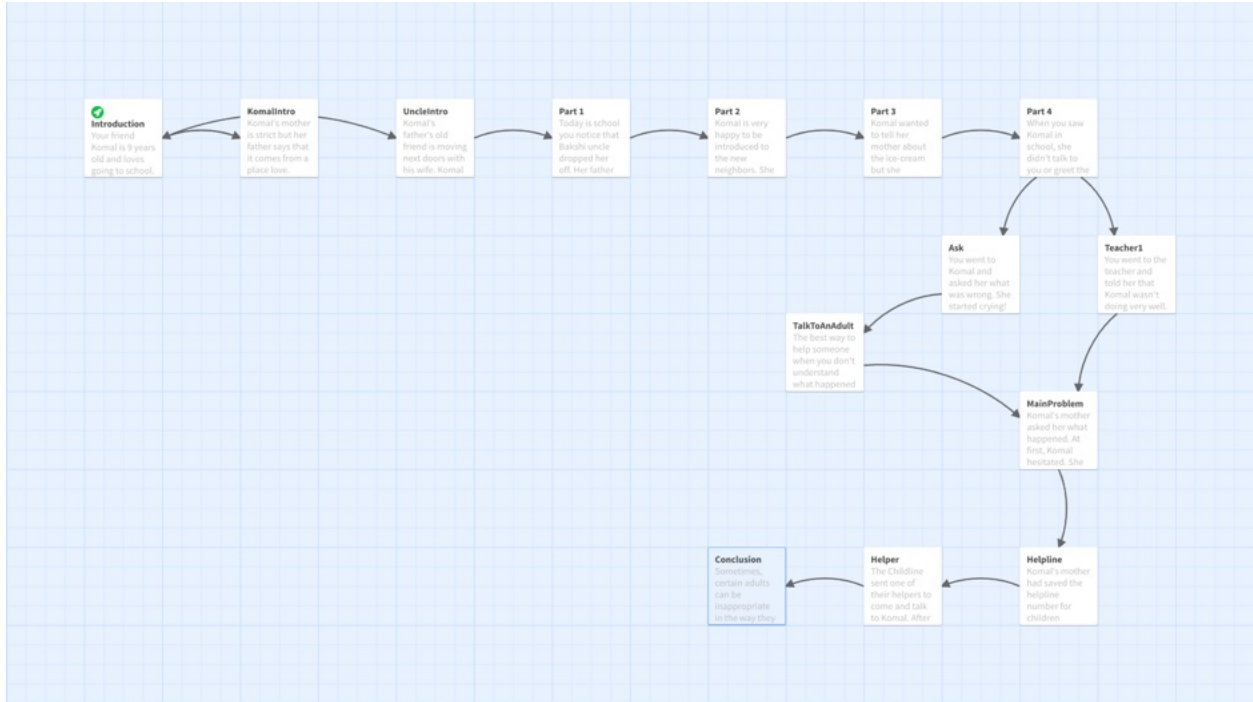


Fig. 3.3.1: Twine based narrative

I also wanted to consider collaborative and interactive environments for children and find ways to deliver content so that they are more involved in receiving it. I thought about collaborative puzzles as group activities to learn different topics in the context,

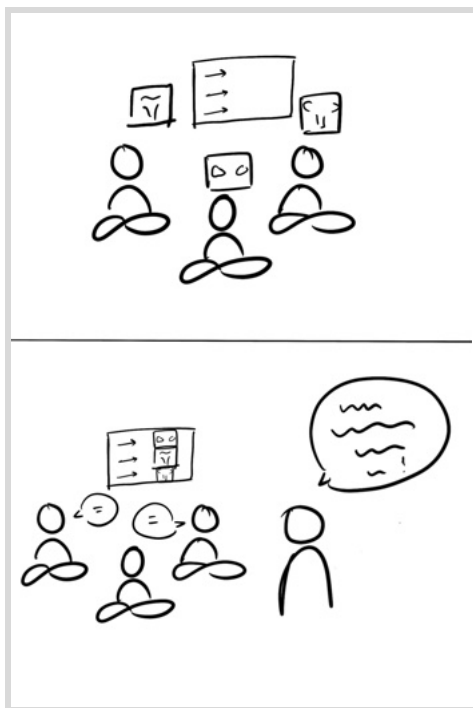


Fig. 3.3.2: Possible group activity ideas

4. Re-defining Project to Design for Visually Impaired/ Low Vision

Through this process and several feedback rounds with faculty and peers, one of the most common suggestions was to narrow down my scope to a much more niche problem. During my continuous conversations with the organization while working on research and ideation, an important discovery I made was that the Introduction to Touch program needs to be extended to children with special learning needs like children with visual impairments, cognitive deficits, etc. One of the more specific issues during the pilot round with children with visual impairments was that there were no tactile or 3D materials available to teach them. Since it was not possible to use diagrams and images, there was no way to provide them with a spatial understanding of the anatomy and physiology and how the reproductive system works. This was a good opportunity to narrow down my scope and work on a more specific problem area.

4.1. Precedents and References

I started looking for precedents for games and interactive activities for children with blindness. The most common patterns through this were embossing or tactile modifications made to existing toys or games.

I also spoke to Erika Teal¹², who is a teacher for visually impaired (TVI) based in Boston. She works on designing and redesigning existing games and curriculums to support teaching children with partial or complete blindness by making them accessible. She has used tools to modify games like Scrabble or Uno to make them playable by children with visual impairments.



Fig. 4.1.1: Accessible modifications to simple children’s games by Erika Teal

¹² Teal, Erika.. Interview with a Teacher for Visually Impaired. 2023



Fig. 4.1.2: Alternative roll and move game board by Erika Teal

Some of her insights based on her experience were-

- Giving verbal descriptions of what is happening plays an important role in teaching blind children
- There are different types of teaching methods while guiding a child's hand over objects to help them understand like - hand over hand or hand under hand
- Especially in the context of anatomy, tactility would play a primary role in communication because it is important for them to understand how things are spatially and how parts fit into the anatomy
- A way to check if the prototype is working is to simply close your eyes and check if you can make the distinctions in different letters/ objects yourself
- Wooden shape puzzles have been proven very useful in communicating shapes developing a sense of space and objects for the children

I found other references of toys and games available for children with blindness or low vision like modified Rubik's cubes.

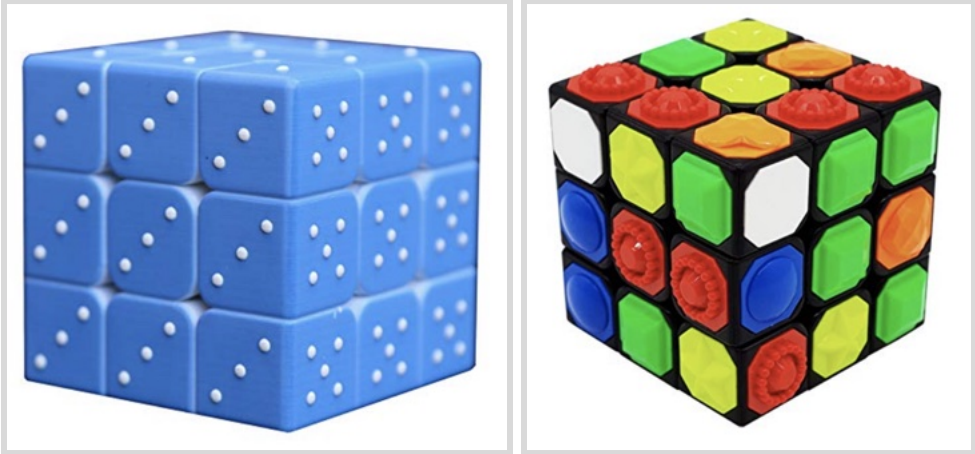


Fig. 4.1.3: Modified Rubik's cubes with tactile surfaces

In Malmö, a city in Sweden, there are tactile maps at the central train station to help guide people with vision impairments.



Fig.4.1.4: Accessible railway maps at the train station in Sweden

Another great precedent I found as a great way to talk about anatomy was the game Operation. Although this game isn't accessible, it is still a great way to understand how organs are placed in a body. I was also curious and inspired by the "Anatomy Jane"¹³ doll which is mentioned in the medical drama Grey's Anatomy. This doll doesn't actually exist but was a part of the show where they could take out all the organs and assemble them back. There are dolls similar to that available to buy. I thought that could work as a very interesting teaching tool.



Fig. 4.1.5: Anatomy Jane Doll from Grey's Anatomy

A precedent that shaped my project the most was the game "Operation" in which children have to perform a surgery and take out organs from a body. The simplicity of the game and its interaction is what makes the game so effective.

¹³ Anatomy Jane Doll, Grey's Anatomy. 2008.

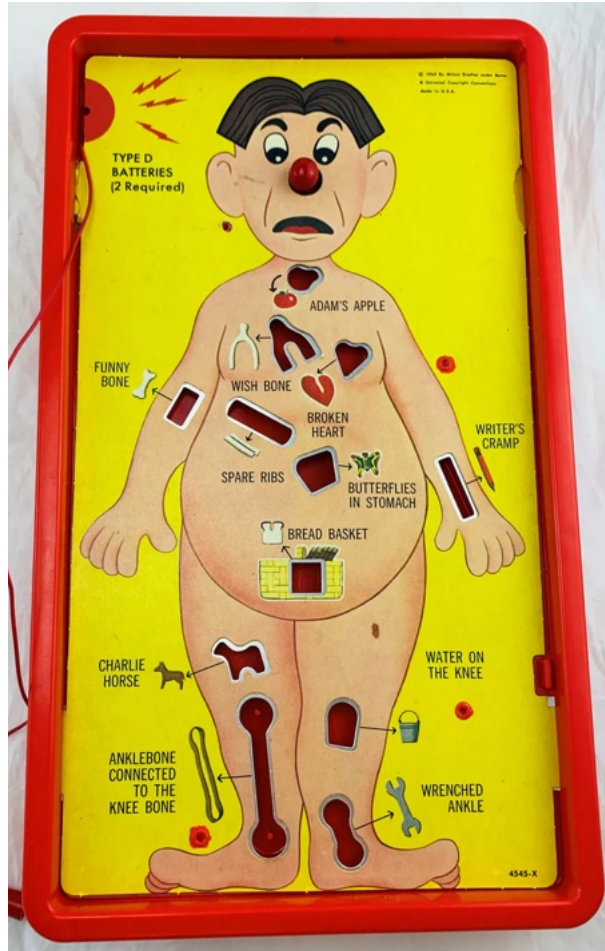


Fig. 4.1.6: Operation game

4.2. Prototype 1

I started my initial explorations to create tactile interfaces by finding simple methods and tools to build them. For the first prototype, I used laser engraving on plywood as a method to create embossed surfaces and braille text. I experimented with negative and positive spaces of the models to test the effectiveness. I also tried cutting different shapes of each organ to test if they can be differentiated.

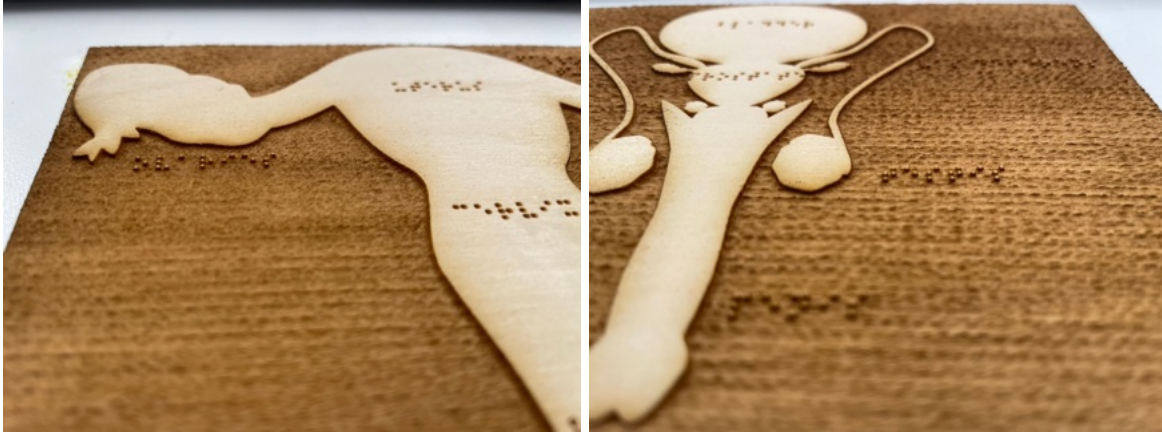


Fig. 4.2.1: First experiment with laser engraving on plywood

While the results of engraving were pretty effective and positive, cutting the organs out did not seem like it could have a use directly. I realized that more than the tools, I had to think about the kind of interactions that I wanted to engage the students in and how they can be used to create a learning experience.

4.3. Prototype 2

I decided to focus on the interaction that the children will have with the tool I develop and utilize the positive results of the laser engraving from the first prototype. Based on the precedents, I designed a shape puzzle that children can put pieces in based on the anatomy.

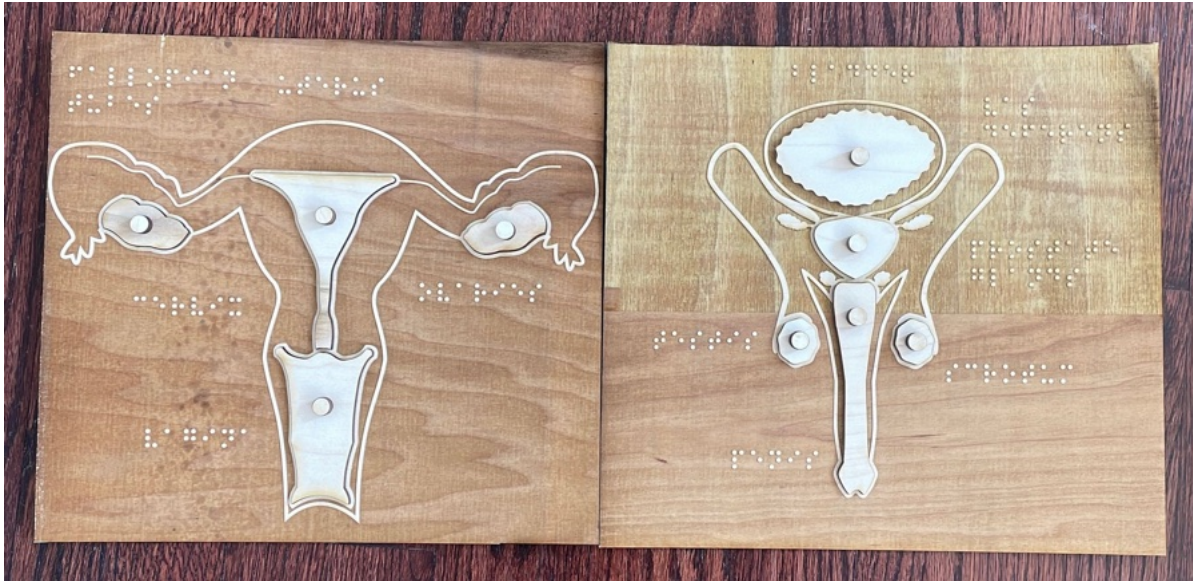


Fig. 4.3.1: Shape puzzle using laser engraving and cutting

Although this worked to test the concept, it had some limitations-

- Laser engraving on plywood exposed uneven layers of the wood making the texture uneven
- It wasn't possible to engrave deep enough to separate an embossed surface from the base
- There was no feedback to the interaction, tactile or other
- The plywood bent due to the heat of the laser creating a curved surface which made it unsteady

I also tried using conductive tapes to create feedback using Arduino, but because of the curved surface of the plywood, the connections were inconsistent and loose. Another drawback of this iteration was that it was still significantly flat and didn't give the sense of a body, life and organs.

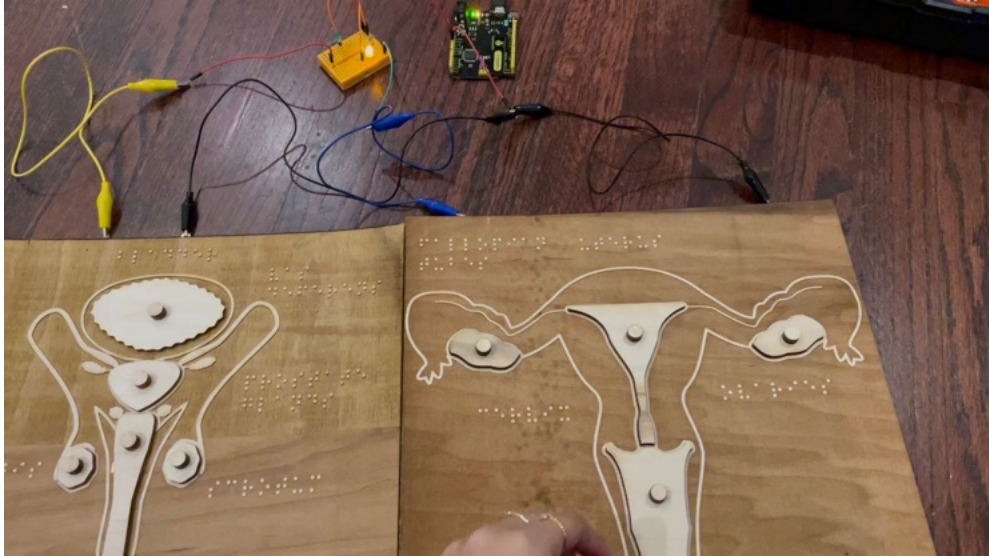


Fig. 4.3.2: Testing with conductive tape to make an LED glow

During this time, I started looking for options for other materials or fabrication methods to build this further and achieve the goals. I received a lot of feedback from peers and faculty at this stage regarding tools, alternatives and a way forward. Some of the big ideas and suggestions were-

- Creating surfaces with different textures for different organs
- Using Arduino sound board by Adafruit for audio feedback
- Using engraving on the back side to make room for electrical components
- Making it resemble real anatomy more by changing the method of fabrication
- Making the pieces easier to snap into place
- Having higher raised edges
- Considering CNC or 3D printing or a combination of different fabrication tools

4.4. Prototype 3

After a lot of discussions, research and contemplating, I decided to give 3D printing a try. I found references to extrude vectors using Blender and create 3D models. This was a great starting point. I was able to use the same files used for laser cutting to modify them into 3D models.

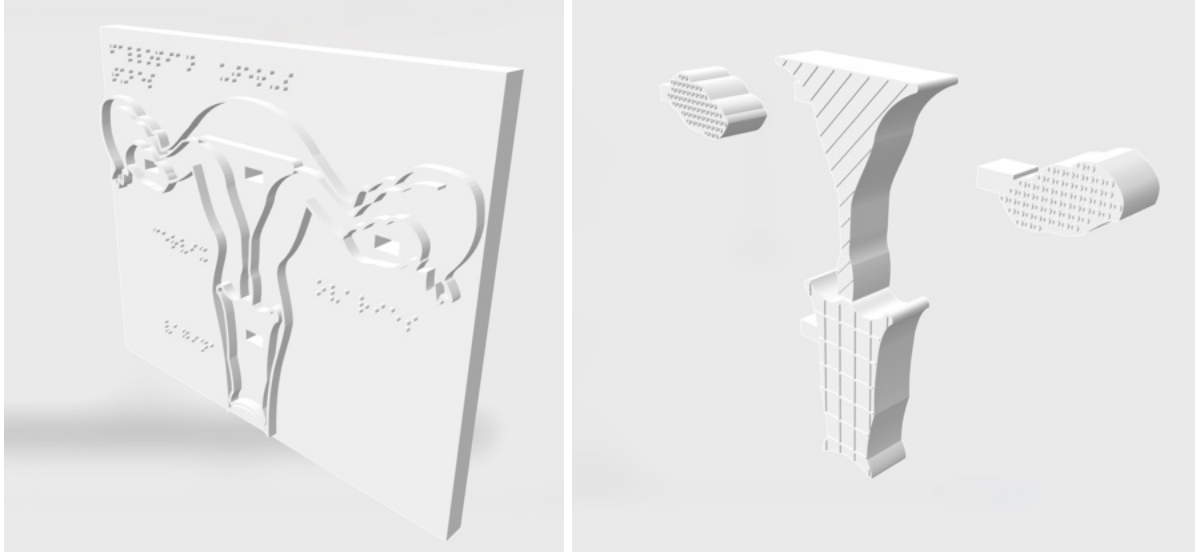


Fig. 4.4.1: 3D model of the base and pieces created using Blender

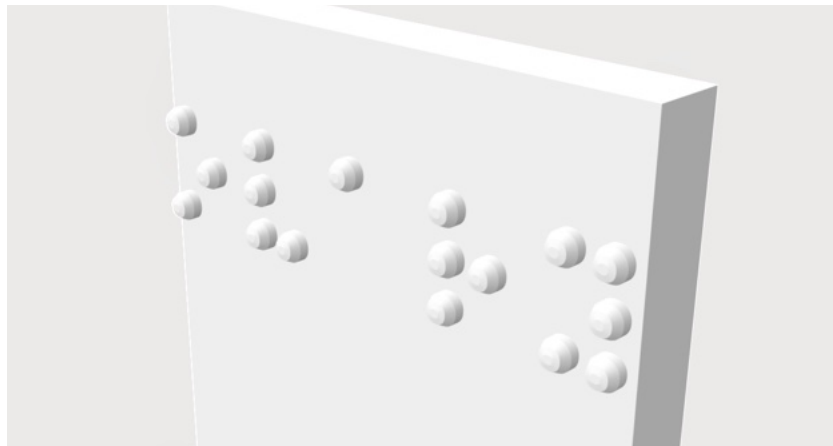


Fig. 4.4.2: Testing out different font treatments for braille text in 3D

I created textures on the surfaces of the organs as suggested in previous feedback and created the model with pegs that can be clicked into place.

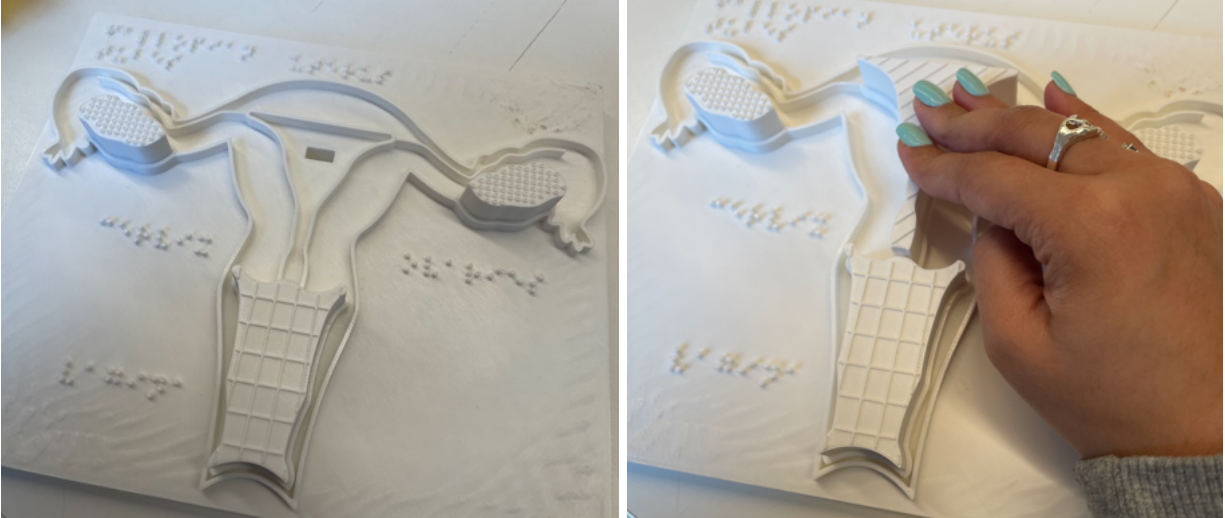


Fig. 4.4.3: 3D printed prototype

Some realizations after printing this were-

- The pieces need to be slightly smaller than the space left for them, I had them exactly fit which made them tight and hard to remove
- The pegs were not necessary if the pieces were sized right, they would click in place without needing any additional support

I also tested this out with the Arduino Sound Board. Since this model did not have issues like the plywood, it worked smoothly.

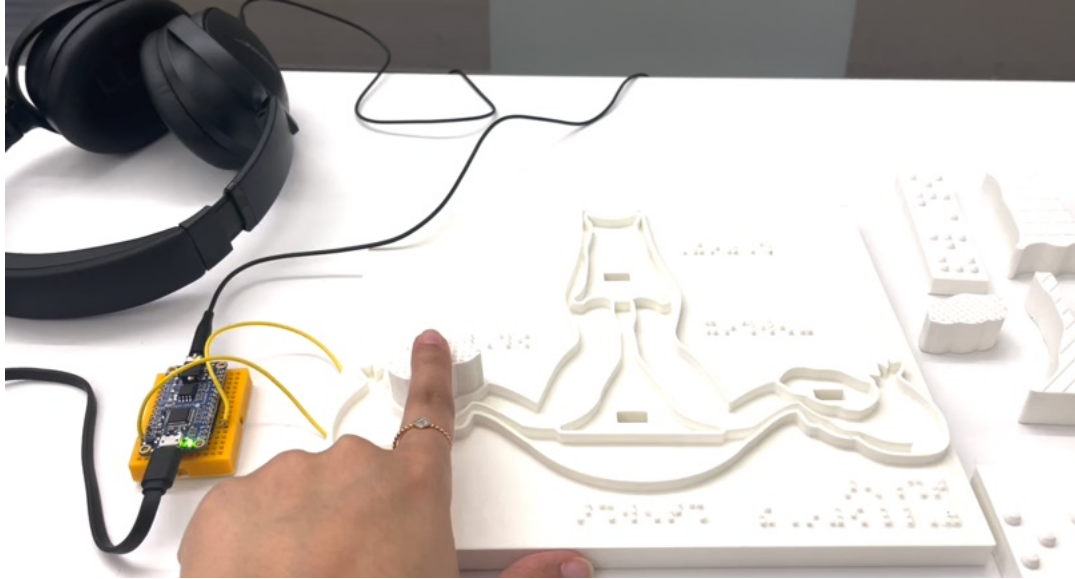


Fig. 4.4.4: Connecting to Arduino Sound Board for audio feedback

Some of the feedback I received for this iteration was-

- Using matching textures in the places each piece fits in
- Using screws to make electrical connections instead of conductive tape to avoid having the holes in the base
- Think about packaging and how all components fit together

I also spoke to Bojana Coklyat¹⁴, an assistant professor who teaches Design for Accessibility at The New School. She herself has low vision and provided some recommendations-

- Using high contrast/ bright colors for the 3D model for children with low vision to differentiate easily
- Using textured fabrics or soft materials on surfaces to give the sense of warmth, body and biology
- Adding some guiding audio at the beginning to help them move through the organs and explain the structure and processes

¹⁴ Coklyat, Bojana. Interview with Design for Accessibility Professor. 2023. New York.

She also suggested not using braille at all, but since the target schools and children are familiar and comfortable with it, I decided to retain that aspect.

4.5. Final Version

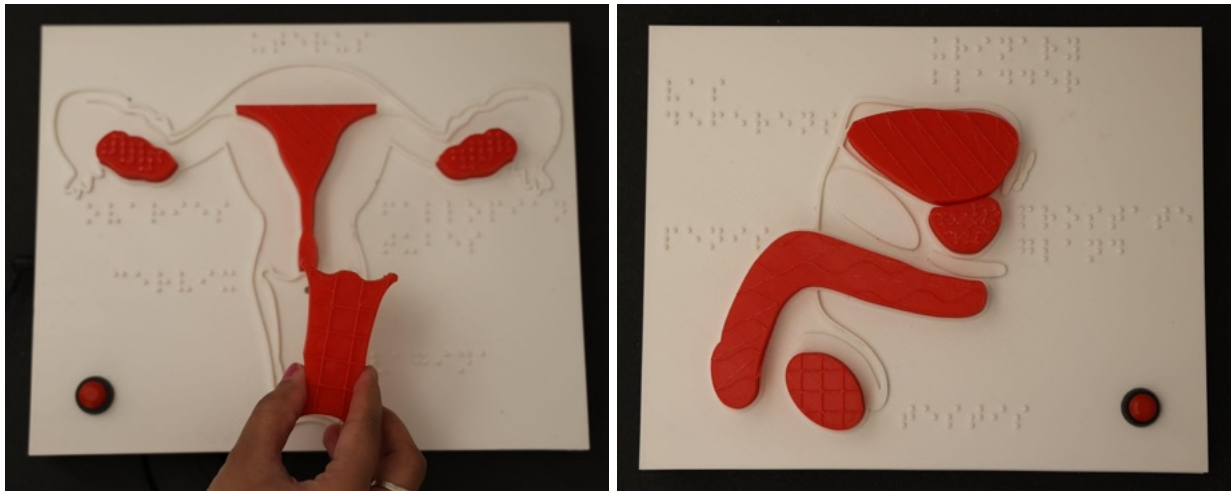


Fig. 4.5: Final Version

4.5.1. Modeling

For the final version, it was necessary to think about how this would run independently, be one unit with concealed connections and not requiring assembly. For that, I made a lower section with a space for the Soundboard, battery pack and volume buttons. I also added a button that could help provide a starting point and an introduction to the audio experience. I also made small pegs on the bottom part that would fit into the top part of the base so that it would be easy to open close but still stay contained.

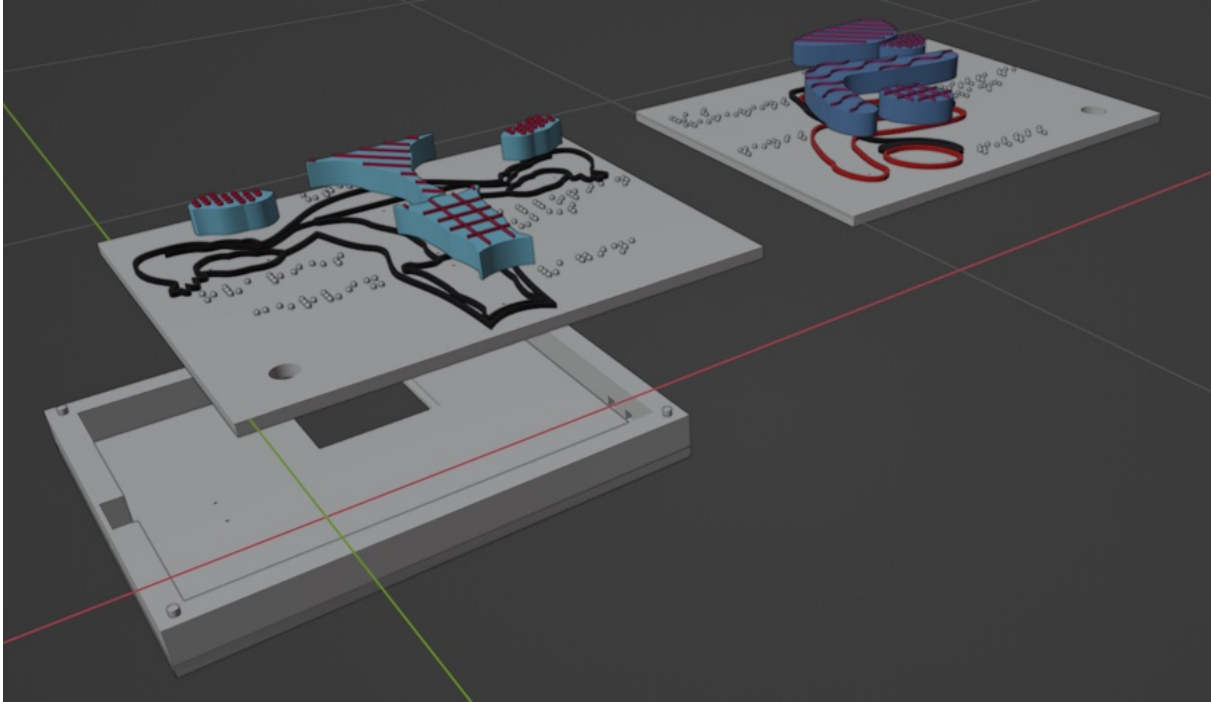


Fig. 4.5.1: 3D Models of the final version

4.5.2. Printing

I then 3D printed the organ pieces using bright red, flexible material to make it warmer, softer and have closer association with the human body and high contrast with the white base. I had to experiment with different variations of the infill to figure out what would make it soft enough but still making sure all the layers and edges stuck together. I covered the bottom of each piece with conductive tape.



Fig. 4.5.2: Pieces with conductive tape on the back

4.5.3. Assembly

To put all the components together, I needed to solder the pins and the backs of the screws together with wires. It took a lot of patience and getting used to, to solder successfully on the PLA without burning or melting it too much. There was a fine balance required between the cooling time of the materials and how long they are heated up for to ensure all were fixed firmly together once they cooled down. I also used insulation tape to avoid any unnecessary connections. The Soundboard was fixed using screws and other components using E6000 glue. I had to alter the prints a bit and use a file to increase spaces in some cases where I didn't estimate for any margins of errors.

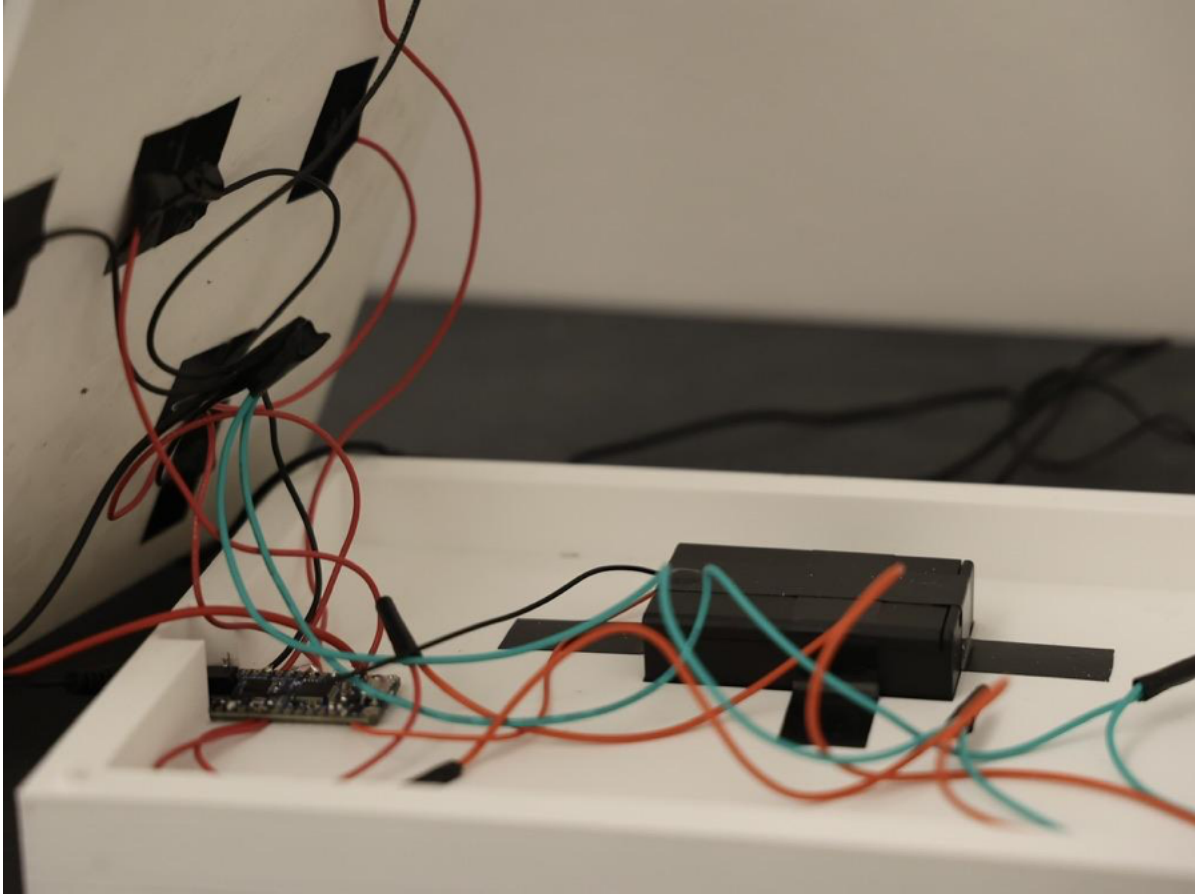


Fig. 4.5.3: Internal components soldered and assembled in place

4.5.4. Audio

The last element of the final kit was the audio. Adafruit Arduino Soundboard has trigger pins that play sound when the pin is on HIGH. It gives different options like looping, latching, playing a series of audio files and so on based on how the files are named. It's a great no-code way to have an audio interface but it comes with its limitations. One of these is that if the trigger is HIGH continuously, the basic trigger file loops. The only way to have it not loop is to set it to the NEXT trigger with no other following audio files.

During testing I discovered that the board checks which pins are triggered serially and if it finds a pin triggered it stops checking for the remaining pins. That meant that I had to make sure that the organ

pieces were sequenced to go from a higher pin number to a lower. Once I had fixed my pins, I made the audio with feedback and collaboration with the members of the organization.

The audio was:

Female:

1. *Pin0*: The system on this board is the internal anatomy of the female reproductive system. This system is located in the pelvis which is the lower part of the abdomen. It's important to learn about the body to feel safe and comfortable with it, as each body is unique. To start with, if you move your hand to the top left of the board, you will notice an almond-shaped organ. Place the associated piece there.
2. *Pin8*: This is an ovary. The ovary is responsible for production and release of eggs. Every girl is born with thousands of eggs in the ovary. It also secretes hormones. There is another ovary on the right side too. You can now place the right ovary.
3. *Pin6*: The eggs released by ovaries go into the fallopian tubes. Here, they may be fertilized by a sperm. If you follow the lines of the tubes, you can find a pear-shaped organ at the center to where these eggs are carried. Place this organ.
4. *Pin4*: This is the uterus. Every month, the body prepares for the possibility of a baby. The lining of the uterus thickens to create a cozy place for a fertilized egg. If there is no fertilized egg, at the end of the month, the lining of the uterus sheds. This consists of blood and is called a period. Remember, a woman does not get periods when she is pregnant. You can now move your hand lower to the tube shaped organ and place it.
5. *Pin2*: This is the vagina and is connected to the uterus by the cervix that acts like a doorway. It opens a little to let the blood and the lining of the uterus flow out during a period or when the baby is ready to be delivered and is otherwise shut. The vagina is the passage that connects the uterus to the outside of the body. It's always good to seek guidance from a trusted adult or healthcare professional if you have any questions or concerns.

Male:

1. *Pin0*: The system on this board is the male reproductive system. This system is located in the pelvic region in the lower part of the abdomen. It's important to remember that each body is unique and different, and that's perfectly normal. To start with, if you move your hand to the top of the board, you will notice a bulbous organ. Place the organ there.
2. *Pin8*: This is a bladder. It stores urine before it is expelled from the body. On the lower right side of the bladder, you will feel a small tube-like structure which is a seminal vesicle. Seminal vesicles produce fluid that contributes to the production of semen. When you move your hand below the bladder, there is a smaller gland that you can place.
3. *Pin6*: This is the prostate gland. Its function is controlled by the hormone testosterone. Its secretions are released into the urethra which is the same passage urine is expelled from your body. There is a valve that prevents the two from mixing with each other. The urethra is housed in a long external organ which you can find and place if you move your hand lower.
4. *Pin4*: This is the penis. The penis is an external organ and contains some special hollow tissues which are filled with blood during arousal making the penis stiff. The secretions during urination or ejaculation leave the body through the lower end or the head. If you move your hand below the penis, there is a small bulbous organ you can place.
5. *Pin2*: This is the testicle. The testicles produce sperm and testosterone. The small tube-like structure on the top of the testicles stores the sperm. Its secretions are responsible for increasing the motility of a sperm to fertilize a female egg. The sperm travels through the vas deferens, which is a long tube that you can feel going upwards. This also contributes to the formation of the semen. It's always good to seek guidance from a trusted adult or healthcare professional if you have any questions or concerns.

5. Reflections

Working on this project made me think deeply about accessibility and adaptability in design. I realized their importance and how we as designers have a responsibility towards the community to ensure we don't exclude anyone. Something that was reiterated for me through my experience working on the

project was the example of curb cuts that Kat Holmes discusses in the book *Mismatched*¹⁵. It highlights the importance of considering accessibility early on in the design process. Curb cuts, originally designed to make sidewalks accessible to people who use wheelchairs, ended up being beneficial to anyone pushing a stroller, towing a suitcase, or riding a bike. Similarly, the interactive press and play could be used to teach anyone about anatomy and physiology, reversing the narrative of accessibility as an afterthought.

Even though there are powerful accessibility laws in place for websites and other public access systems like transportation and built environments¹⁶, there is a need to extend these to other systems including social movements. There is a need for advocacy, awareness, compliance as well as funding for inclusive solutions.

My collaboration with Jnana Prabodhini's Institute of Psychology provided a unique opportunity to approach the design process from an accessibility-first perspective. By taking into account the needs of children with visual impairments, I was able to create a more inclusive and engaging learning experience that could benefit all children in the program. This highlighted the importance of considering accessibility early on in the design process, even in such movements that are meant for an intersection of society. An accessibility-first approach can benefit a much broader community than intended and bridge the gaps in knowledge, information, and safety between different sections of society.

The final kits will be sent to India for on-site testing and implementation and I hope that it gets built and shared with more communities, organizations or schools.

¹⁵ Holmes, Kat. *Mismatched* (Page 31, 32), 2018

¹⁶ Department of Empowerment of Persons with Disabilities, Accessibility India Campaign, 2015

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7. Bibliography

- "Accessible India Campaign." n.d. Department of Empowerment of Persons with Disabilities. Accessed March 11, 2023. <https://disabilityaffairs.gov.in/content/page/accessible-india-campaign.php>.
- Anatomy Jane Doll, *Grey's Anatomy*. 2008.
- Carson, D. K., J. M. Foster, and N. Tripathi. 2013. "Child sexual abuse in India: current issues and research." *Psychological Studies* 58 (3): 318-325.
- Charlotte. 2017. *Activity books for elementary school children*. India.
- Choudhary, V., S. Satapathy, and R. Sagar. 2018. "Development of a multi-dimensional scale to measure trauma associated with child sexual abuse (MSCSA) and its ramifying impacts on children: A pilot study." *Asian journal of psychiatry*, no. 31, 27-35.
- Coklyat, Bojana. 2023. *Interview with Design for Accessibility Professor*. New York.
- Deshpande, Shamangi. 2022. *Interview about the program*. India.
- Dewaele, R. n.d. "File:Male genital system - Front view.svg." Wikimedia Commons. Accessed May 11, 2023. https://commons.wikimedia.org/wiki/File:Male_genital_system_-_Front_view.svg.
- "Educational Games and Interactive Lessons." n.d. TinyTap. Accessed October, 2022. <https://www.tinytap.com/content/>.
- Erikson, Erik. 1963. *Childhood and Society*. 2nd ed. New York: Norton.
- "File:Human male reproductive system en.svg." n.d. Wikimedia Commons. Accessed May 11, 2023. https://commons.wikimedia.org/wiki/File:Human_male_reproductive_system_en.svg.
- "File:Scheme female reproductive system-hu (1).svg." n.d. Wikimedia Commons. Accessed May 11, 2023. [https://commons.wikimedia.org/wiki/File:Scheme_female_reproductive_system-hu_\(1\).svg](https://commons.wikimedia.org/wiki/File:Scheme_female_reproductive_system-hu_(1).svg).
- Gao, Yumeng. n.d. *Let's Chat*.
- Good Touch-Bad Touch -"Underwear, Swimsuit Rule" CDC Health Standard Four*. n.d. N.p.: Health is Elementary.
- Holmes, Kat. 2018. *Mismatched*.
- Sharp, John, Colleen Macklin, and Kyle Li. 2022. New York.
- "Talking About Reproductive and Sexual Health Issues." n.d. Accessed October, 2022.
- Teal, Erika. 2023. *Interview with a Teacher for Visually Impaired*.