Accessible Design: Exploring the Ideation and Sketching Process with Blind/Low-Vision Individuals

by

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~ Project Proposal Approval Form ~

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Project Title: Accessible Design: Exploring the Ideation and Sketching Process with Blind/Low-Vision Individuals

Project Area(s):	☐ Application Dev.	☐ Database	☐ Website Dev.
(√ primary area)	☐ Game Design	x HCI	☐ eLearning
	☐ Networking	☐ Project Mngt.	☐ Software Dev.
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	☐ Geospatial	☐ Other _____	

~ MS Project Committee ~

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1 Abstract

The ideation process is arguably one of the most integral steps in the technological design process. Ideation allows for generating ideas and solutions through various methods such as discussions, sketching, and brainstorming. Sketching is a valuable strategy to ideate broadly and quickly on solutions to a given design problem. However, this process is often heavily visually based and relies on collaboration between designers, who are often sighted. There are very few, if any, blind or low-vision designers in the user experience field. Frequently they are consulted in the beginning and end stages of a user experience project for feedback on a design or concept but rarely are they given the lead or act as a designer. This proposal seeks to understand how to create an inclusive and accessible environment for sketching and ideating for blind and low-vision designers. In my study, I conducted a remote design workshop and training session with novice designers and allowed the blind designer to take authorship of solutions. The study utilized qualitative data such as video/audio recording and pictures of artifacts for analysis. All workshop participants and researchers engaged remotely via the Zoom platform. The training session allowed the blind/low-vision participants to become more comfortable with the design process by completing a guided design activity. The design workshop was similar to the training session; however, the facilitator had a minimal hands-on role and included blind/low-vision and sighted participants. After the workshop, participants partook in a debriefing session about their experiences throughout the process. Results showed that there were concerns in collaboration and language which could be addressed by further educating sighted individuals on the blind/low-vision experience. Additionally, the materials selected could be alternatives to pen and pencil sketching, however there is still room for further improvement.

2 Introduction

Ideation is a critical step in the design process. It allows for the flow and generation of many potential solutions. With ideation you can come up with many possible ideas without the need to commit to a single idea. Sketching is one of the most common ways to ideate, both as an individual and with others. It is generally a fast-paced method that allows people to quickly visualize solutions through low-fidelity materials, like paper, post-it notes and pencils. It is a powerful brainstorming tool that has applications in various fields to help teams come up with solutions [10]. The benefits of sketching as an ideation method are numerous, but it is inherently visual, meaning that it is inaccessible to blind or low-vision individuals.

Due to the visual nature of sketching, blind and low-vision people may be reliant on their sighted peers to communicate visual information through words that may not be as descriptive as the image itself. Information can often be lost or incorrectly relayed when describing inherently visually based information[12]. Sketching situates blind designers at a disadvantage when compared to their sighted peers and can isolate them in brainstorming processes. There have been studies that seek to create an accessible ideation environment for blind co-designers. Many of these studies utilized tactile materials such as clay, construction paper, pipe cleaners, as well as other materials, and note that additional exploration of materials would be beneficial [1,3,9,17,22]. Other studies have sought to understand the dynamics of blind designers in a sighted environment and important concepts such as interdependence versus independence and empathy [2–4]. Additional research has explored translating traditionally visual methods of information into a non-visual means and understanding [6,19]. While prior literature has investigated many topics in working in co-design environments with blind and low-vision participants and prototyping with tactile materials, there has been little work exploring co-design dynamics, in which the blind designer retains ownership and controls the direction of a solution. My study is unique in that it presents the blind designer in a position where they make executive decisions while their sighted partner takes on a secondary role as an assistant.

The goal of my study is to seek opportunities to make the technological design process more accessible to blind or low-vision people to support them in creative environments. A secondary goal is to determine the feasibility of the materials given in providing an alternative to pencil and paper sketching during the ideation process. Additionally, since the trainings and workshops were held remotely, I will gather insight on best practices to use when conducting a remote workshop with bind and low-vision participants.

I first conducted two training sessions with six blind and low-vision people to allow them time to familiarize themselves with the user-centered design process, as well as introduce them to the materials they received. Next, I conducted three design workshops with the same six blind participants and an additional six sighted participants, most of whom had no experience in the technology design process. The workshops' results indicate that there may be an opportunity to teach sighted people on the blind/low-vision experience to address some concerns brought up within the collaboration process.

The presented study presents the following contributions:

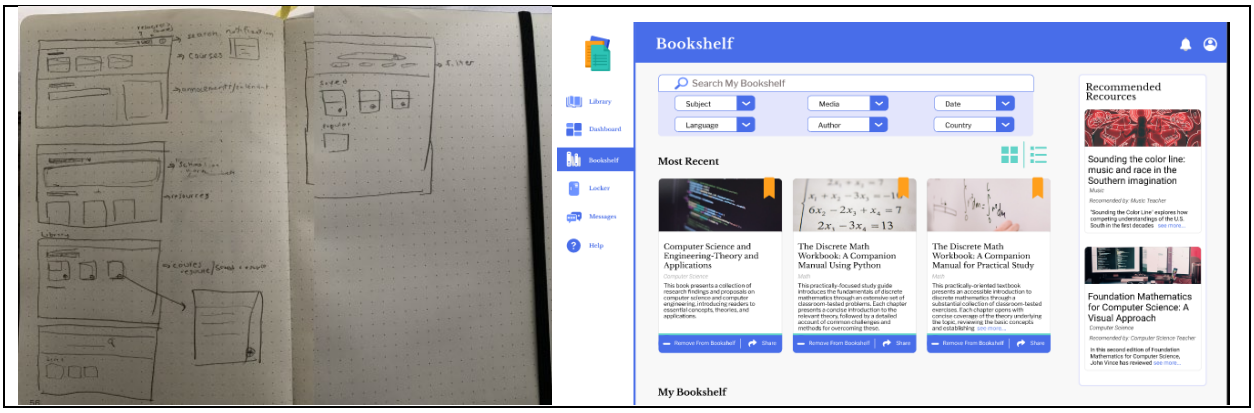
- Understanding on how to improve the technological design process to be more accessible to blind or low-vision people
- Ways to support BVI in creative environments
- Best practices in running a remote workshop with BVI and sighted individuals

- Insight on accessible materials as tools during the ideation process

3 Prior Work

Sketching in the Design Process

The user-centered design process commonly has four main steps: 1) Defining Context/Problem, 2) Ideating, 3)Prototyping, and 4) Evaluating/Testing. Sketching commonly occurs in the ideation phase as a means of quickly communicating ideas and solutions to share with collaborators, such as designers, stakeholders, and researchers (see Figure 1). Sketching is an important asset in the toolbox of designers as it will help them to obtain feedback and opinions earlier in the development cycle and allow for less viable ideas to be phased out. This helps focus the directions of a project and in turn, leads to less frustrations, pain-points, and development issues later down the line. In summary, sketching is a wonderful tool during the exploratory phase of a project and prevents spending extra time, money and resources on ideas that are not feasible.



(Figure 1. Sketch to High-Fidelity Prototype Example)

Sketching with Tools

Ideation is an integral beginning step to the design process and sketching is an often-used method to ideate. Sketching is especially useful as it is a quick method to convey ideas utilizing low fidelity materials, like pen and paper [10]. However, this method is traditionally visually based, which leads excludes of blind and low-vision individuals. There has been research seeking to explore or create methods of sketching that are accessible to blind and low vision people. Bornschein and Weber [8] conducted an analysis on current digital drawing tools for blind users and discovered a gap in which no available tool meets all the requirements and needs set by blind people.

Researchers also explored the needs and wants of blind users who draw or annotate with drawing tools and created a list of recommendations that should be heeded in creation of such tools [16]. A later paper by Bornschein [7] proposes a system to allow users to create tactile artifacts and addresses the issues of current tactile drawing systems. One study designed a tablet-based audio-haptic drawing tool specifically for the collaboration of both sighted and blind individuals, however the design is still in its infancy and requires substantial user testing [11]. While these studies illustrate an interesting and evolving area of research, they mainly focus on tools, which may be inaccessible due to price and

availability. My study seeks to use inexpensive materials due to ease of access and use, which will be explored later in this review of prior work.

Understanding Visual Elements for Blind People

Many aspects of the digital world are inherently visually based, and methods for navigating or understanding digital elements may be vastly different for blind people than for sighted people. Schaadhardt et al. [20] sought to understand this challenge in terms of screen readers and digital artboards. Findings showed that when using artboards (Microsoft PowerPoint, Adobe Illustrator) blind users often felt excluded due to the inaccessibility of presentation software and felt as if they were often forced to be readers of content rather than creators. An additional study evaluated the accessibility of many high-fidelity prototyping tools with screen-readers that found a similar short-coming in accessibility [14].

Another study investigated how blind and low-vision individuals engage in tasks that require visual spatial understanding [17]. The authors used a participatory study design, which will be discussed more later, and determined best strategies to use when describing visual layouts, such as using a guiding edge or point and uses relative position terminology. Information from these studies will be vital in communicating with the blind designers and ensuring that communication is clear, and the blind designers don't feel pressured.

Participatory Workshops with Blind and Low-Vision

Participatory workshops are useful to understand the needs of target users while actively involving the target users in the study. Williams et al. [22] used a participatory approach to allow visually impaired individuals to design their own wearable aids. Researchers recommended the use of materials that are easily manipulated, to use small group settings and, and to provide additional training for blind participants beforehand [19]. Another study that utilized co-design noted the benefits of participatory design since it was useful in understanding different perspectives. Researchers noted that when working with blind and low-vision participants, organizers should make sure that facilitators adapt to accommodate BVI participants and to ensure that materials are in an accessible format, since many visual tasks make it difficult to share information with BVI designers [12]. Li et al. [13] held a participatory design workshop to understand how blind and low vison people create and edit layouts to create design considerations for developing authoring tools that are accessible. In that study, researchers echoed a previous suggestion of using training sessions to allow BVI participants to understand and become familiar with materials and processes. Other studies provided insight on how to balance roles, structure the workshops, and facilitate workshops with people with disabilities in mind [1,3,5,9,19]. Finally, many of the studies provided suggestions on the types of materials that may be accessible to BVI participants, including Wikki Stix, Braille labels, Playdough, cardboard, clay, Velcro, clipboard, tape, scissors, printer paper, construction paper, pipe cleaners, electronics, popsicle sticks and more [1,3,5,9,15,17,22].

Meeting with Blind Domain Experts

To further inform the project I had a meeting with two blind researchers, Chancey Fleet and Josh Mieleand, who had prior experience with running workshops with blind individuals [18,19]. In the meeting, I discussed the basis of the study design and asked for their advice and feedback on how to approach introducing the concept of sketching and design to blind and low-vision people. The blind

researchers explained that blind/low-vison people may not have a perception of sketching as sighted people do. Sketching and drawing are concepts that have be taught and exposed to sighted people ever since they could hold a pencil, but to many blind people this would be a completely new notion. They encouraged us to consider that it may be unfair to the blind participants to be dropped in a situation in which they are completely unfamiliar and to find a way to familiarize blind/low-vision with the idea of sketching prior to working with a sighted partner. This valuable feedback prompted us to include a training session to my original study design.

4 Pilots

Training Session

Two training session pilots were conducted with three sighted participants, a facilitator and assistant. The facilitator's role included running the session and guiding discussion. The assistant took notes and help assisted with background logistics such as recording and admitted participants into the room. These sessions were conducted remotely via Zoom and the duration totaled approximately one hour. The pilot training sessions were marketed as a User-Centered Design workshop for college students already enrolled in a user experience related major and within their first two years of the program. The training pilot was adapted to be a mixture of both the training session and workshop. The main goal of the pilot was to test and evaluate the following:

- The two design prompts (see Appendix A) and how participants would react to them
- The flow and timing of the training session
- The presentation

Based on the insight from the pilot trainings session, I changed the following aspects of the training session

- Introduced more structure to the mini design activity
- Approved the museum prompt (see Appendix A) for design workshop

Workshop

There were two pilot workshops with two sighted participants and one pilot workshop with a blind and sighted participant. All participants for the workshop pilots had very little experience with user-centered design concepts, with two participants having a vague understanding as they have experience in software engineering. The pilots containing only sighted participants were to mainly test out the flow of the design workshop and the time allocations for each section. The pilot with the blind participant was treated as a dry run of the workshop and to determine what would need to change for the next interaction of workshops. Based on the insight I chose to adjust the following:

- Add another pair to the workshop so that the blind participant is not alone
- Added an additional prompt in case participants did not have experience with one or the other
- Adjusted the time for sections during the design activities so that participants did not feel rushed

5 Training Sessions

Participants

A total of 6 BLV participants attended the training workshops. Participants were recruited from various organizations and centers that support or are run by blind people, such as the National Federation of the Blind (NFB). All participants had no experience with technology design or development. All participants reported using assistive technology, such as screen readers, magnifying software, and white canes/guide dogs in their daily lives.

ID	Vision Status	Occupation	Experience with design and technology development
P1	Blind with light perception	Undergraduate Student	No experience
P2	Low-Vision/Legally Blind	Artist	No experience
P3	Low-Vision	Recent Graduate	No experience
P4	Low-Vision	Assistant Professor	No experience
P5	Blind	Graduate Student	No experience
P6	Blind	Rehabilitation Counselor	No experience

(Table 1. Chart of blind and low-vision participant demographics)

Procedure

The training sessions lasted about an hour with three participants in each session. Additionally, I acted as the facilitator with the help of an assistant. I moderated and fostered discussion and communication between participants, while the assistant managed the logistics of a Zoom call in addition to taking observational notes. Each session began with introductions of the researchers and participants shared their vision status. In the first session of the workshop participants learned about the concept of user-centered design and the steps it entailed. Following the presentation participants had the opportunity to practice the first two steps of the user-centered design process: defining the problem and ideation. The training session concluded by informing participants what to expect during the design workshop and going over the materials that would be provided through the mail. No participant received materials prior to the training workshop due to delays in shipping, but all materials arrived shortly thereafter and before the design workshops.

6 Design Workshops

Participants

Participants in the design workshop included all participants from the training session in addition to 6 sighted participants. Sighted participants were recruited through social media and forum posts as well as advertisements around college clubs and environments. In the recruitment materials, I advertised that participants should have little to some background in user experience design, which resulted in sighted participants all had varying levels of experience with user experience design concepts, technology design or development. Upon the completion of both the training and design workshop, blind participants received $80 compensation delivered through peer-payment platforms. Sighted participants received $40 compensation upon the completion of the design workshop. Sighted participants did not attend training sessions and only participated in the design workshop.

ID	Occupation	Experience with design and technology development

S1	Graduate Student	Previous experience in UX design and research
S2	Graduate Student	No experience
S3	Software Engineer	7-8 years' experience as a Full-Stack developer
S4	Graduate Student	No experience
S5	Graduate Student	Previous Android application development
S6	Mechanical Engineer	No experience

(Table 2. Chart of sighted participant demographics)

Workshop Materials

All BVI participants received a package of materials (Figure 3). Each package included 1) multicolored felt pieces cut in the shape of squares, circles, rectangles, and triangles, 2) two foam boards roughly the shape of a mobile phone, 3) scotch tape, 4) pipe cleaners, 5) stick-on gems, 6) 2 containers of mini play-dough of varying colors, 7) a wooden ruler laser cut with various shapes, and 8) an example of a login screen. Login screens are common interaction in the digital world, which is why it was chosen as the example. The design was based on the common features present on the different login screens of the digital world.

(Figure 2. A photo of workshop materials)

Procedure

Setup

We conducted three separate remote design workshops with a total of four participants in each session. All sessions were held through video teleconferencing software. Each session included two blind or low-vision, two sighted participants, facilitator and assistant. As the facilitator, my role was to help guide,

moderate and conduct the workshop, and the assistant was responsible for behind the scenes logistics and recording the sessions.

Introduction

The workshops started with a brief introduction and overview about what would take place during the workshop, reviewing the informed consent form, presenting the goal of the study, and introducing the facilitator and assistant. During the introduction, participants all shared their vision status, visual descriptions, occupations, and a fun fact about themselves.

Presentation

We presented a brief 10-minute slideshow about User-Centered Design (UCD). Topics included defining UCD, the steps, and the benefits of using the process in development. Participants were encouraged to ask questions if they did not understand something or needed clarification at any point of the presentation.

Guided Discussion

Following the presentation, participants engaged in a discussion (see Appendix B) where they reflected on their relationship with technology and how it has evolved over time. Additionally, participants were asked to remark on their favorite and least favorite pieces of technology and come up with the reasons why they held that opinion. The discussion lasted about 10 minutes.

Design Activity and Wrap-Up

The design activity and wrap-up lasted for approximately an hour and 25 minutes. Participants were given a brief overview of what will take place during the activity and introduced to the roles. There are two roles assigned to participants based on vision status. Participants who identified as blind or low vision were assigned the role *Designer with Materials (WM).* Those who identified as sighted were assigned the role of *Designer without Materials(NM).* The WM was responsible for creating the sketch/prototype and ultimately had the final say on what was included on the final product. Additionally, the WM contributed ideas and suggestions. The NM also contributed ideas as well as offered feedback and suggestions on the ideas. Next, I went over the materials provided and added clarification as needed. Lastly, participants were informed about the two prompts (see Appendix A) that they were to design for. Both prompts were sent to participants ahead of time so they could review the information as needed. Participants were then randomly assigned into pairs (one sighted and one blind/low-vision) and separated into breakout rooms with one researcher overseeing the activity.

Workshop	Pair ID	Participant ID	Experience Level
Workshop 1	Pair 1	P1	No experience
		S1	Previous experience in UX design and research
	Pair 2	P2	No experience
		S2	No experience

Workshop 2	Pair 3	P3	No experience
		S3	7-8 years' experience as a Full-Stack developer
	Pair 4	P4	No experience
		S4	No experience
Workshop 3	Pair 5	P5	No experience
		S5	Previous Android application development
	Pair 6	P6	No experience
		S6	No experience

(Table 3. Chart of workshop pairs and experience levels. Participants that share the same number indicate a pair)

The activity was split into timed sections. The time allotment and description for each section is presented below. While each section was timed, if participants felt they exhausted the discussion to any portion, they could move on to the next section. Following the design activity, we reconvened as a larger group. Participants then shared their completed prototypes (see Appendix D) with the larger group. After the brief demonstrations, I lead a group discussion (see Appendix B) in which participants reflected on their experiences working together to create the solutions.

Section	**Time**	**Description**
Define the Problem	5 Minutes	Pairs reflected on their experience with the prompt and came up potential problems.
Ideation	10 Minutes	Pairs came up with solutions to address the problems they discussed in the last section.
Sketching/Prototyping	15 Minutes	Pairs used materials to create a sketch or prototype of some of the solutions they came up with in the last section.
Feedback/Reflection	5 Minutes	Pairs reflected on what they created so far and thought about any challenges they for see with their solution
Refinement	15 Minutes	Pairs finalize their solutions by addressing what was discussed in the previous section
Final Demonstrations	10 Minutes	Pairs present their solution to the larger group

(Table 4. A chart showing each phase of the design activity)

Debrief

In the debriefing section of the workshop, the facilitator and assistant each led a separate discussion (see Appendix B) with either the two blind/low-vison participants or the two sighted participants. The debrief lasted about 10 to 15 minutes.

Data Collection and Analysis

Video and audio recordings and observation notes of the subjects performing tasks will be made as well as image stills of artifacts created by participants. Workshop audio was transcribed. To analyze the data, I used a qualitative analysis methodology. An inductive coding approach using a mix of in-vivo and open coding followed by a thematic analysis to discover emerging patterns and themes were used.

7 Results

A total of 12 participants took part in the design workshop (six sighted and six blind/low-vision). All participants except for S6, completed the entire workshop. S6 missed the final discussion and debriefing session. Overall, based on participant feedback and my view of how the workshops went, I believe that all three workshops were successful. All workshop pairs produced a prototype (see Appendix D) addressing one of the two potential prompts. The museum prompt (see Appendix A) was the most popular with four of the six pairs designing solutions for them. All pairs were able to create a finalized version of their prototype with some pairs working all the way up to the deadline to finish their solutions, leading to some instances of them not implementing everything they sought to address.

There were over 150 unique codes collected in the code book which were categorized into themes and sub-themes (see Appendix C). Several themes emerged through data analysis, including themes of communication and collaboration during the design activity; trends and opinions on various materials used; and conclusions and reflections of participants on the overall experience throughout the workshop.

Partnership Experiences

The design activity encourages participants to discuss and work as a team to finish the task. There were five main sub-themes discovered during the process, which I have chosen to group under the main theme entitled partnership experiences.

Language and Communication

A common pattern witnessed during both observations and transcripts was language. Participants often felt that it was difficult to use language to express their ideas or were concerned about how they were expressing their thoughts. Language usage was a concern mostly shared by sighted participants.

"It's like, you don't always have the greatest words to like, describe something, you know, so like, I would try- I would try to like describe, like, oh, maybe it should be this way." - ***S5***

One participant had never worked with blind and low-vision people before and was concerned about using language or terms that would be offensive to them.

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*"And I was, like, nervous of using insensitive language by accident" -****S2***

From observations, I noticed that while sighted participants voiced concerns about how to use language to describe actions and ideas, the blind participants showed some confusion on how to execute ideas. One pair of participants spent around 5 minutes to get their prototype to a level to which the sighted participant felt okay with.

Most participants reflected that communication was essential for the activity, which was also observed by researchers. Observation showed participants communicating back and forth to ensure that both members of the pair were on the same page about what was occurring.

" And as she was working, she was saying, "I'm doing this", [or] "this is where I'm putting things"" – ***S2***

"… it was very easy to navigate, you know, [S3] was like, "Okay, I think that actually, the camera button should go here". And I was like, okay, that's, that's very easy to move right now, like with our base, you know, when to refer or find things." – ***P3***

We noticed that when the activity initially began participants showed signs of apprehension and nervousness as they took long pauses of silence unless prompted by their partner or the researcher. This was noticed more amongst blind or low-vision participants. However, the longer the pairs interacted the more they would communicate to each other.

"But ultimately, as we were talking, it became easier and easier." – ***S2***

Another factor of communication involved materials usage. The participants who were assigned the Designer with Materials (DM) often used descriptive language, detailing the exact materials they were using and were they were placing it. This was noticed by the sighted partners and a conscious effort by some blind partners.

"I think that as I was working, since I wasn't able to, like, hold it in front of the camera, as I was putting things on, you know, I like to think that I was descriptive with what I was doing." – ***P3***

"And [P4] was very descriptive of whatever [P4] was doing" – ***S4***

Most pairs were seen contributing to the design solutions equally, either asking each other their opinions about using a certain material or suggesting an idea. However, there was an instance between participants P5 and S5 in which it seemed like P5 dominated the conversation. In the group discussion and debriefing, most participants would share, but P5 was observed often cutting others off or talking for long periods of time. Across pairs there appeared to be differences in collaboration based on experience levels with participants. Pairs in which a sighted pair had experience in user-experience design or technical development produced more grounded and practical ideas, while pairs in which no member had experience created more ambitious, out of the box solutions (see Appendix D).

Additionally, sighted partners with experience were noted to have a specific way in which they approached their problem solving.

Concerns and Benefits in Collaboration

The activity was designed to encourage pairs to work together to come up with a solution, so it was no surprise that collaboration is a major sub-theme from the thematic analysis. One participant noted that having a partner was a benefit to completing the activity.

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*"And I think that's really cool to have other people to bounce off of like that and being able to brainstorm and have an actual like thing and stuff to mess with is I think more helpful than maybe just spit-balling but I think it's fun, really good. " – **P2***

Furthermore, when sharing ideas, sighted participants were observed to share ideas that were not accessible for blind or low-vision users. There were instances where pairs would brainstorm ideas or a way to organize information that, in the opinion of the blind partner would be more of a hinderance rather than a benefit.

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*"… he consider[ed] to put the information of the drop down kind of side by side. And I thought, well, for a screen reader, that would be a little bit confusing." – **P6***

*"He said, for example, QR codes, but I was telling him, okay, QR codes may not work for me, because how am I going to know, where's the QR code? So, for me, we will have flyers with braille or announcements throughout the museum, let them know, we have stuff for them, specifically for blind users, or low vision users, or everybody can use these things." - **P5***

Additionally, there were also examples of sighted and blind participants giving more priority to some ideas in comparison to others. In one instance, a pair who had chosen the museum prompt came up with two different solutions to address navigation issues. One solution was a mobile application on a phone and the other made changes to the physical environment to help navigation when using a white cane.

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*"Things like that, you know, he had great ideas for the app, but for example for getting there. For the getting there part. I was more concerned about that part. And I think we didn't prioritize that part enough." – **P5***

An additional observation that was noticed was that P5 seemed to not be confident in their design skills. P5 apologized for their lack of design skills several times and expressed doubt in their abilities. This lack

of confidence prompted the P5 to share how he wished their partner would have been more explicit in critiquing their designs. This idea is further explored in the section *Reflection.*

Sharing Backgrounds and Prior Experiences

A common occurrence amongst participants was sharing their backgrounds and experiences as a way of approaching the design activity. This sub-theme can be further separated into two parts, with the first being backgrounds and experiences to inform design choices. All pairs utilized their previous experiences and backgrounds as a basis for design decisions. Blind participants used their knowledge of working with different assistive technologies or life experiences to inform design.

The second part is backgrounds and experiences as assets, or when participants utilize prior knowledge to make informed design decisions. One participant shared their experience working with a sighted software engineer and their prior knowledge of assistive technology and how their different backgrounds played out during the design activity.

> *"I think we also worked well in terms of our background knowledge. [S3] works in IT, or computers of some kind…but he has a lot of experience- it sounds like with software design and application building and things to that effect. And then I was pulling from my experience going to various museums and- and the different- the different audio devices and different things that I've seen."* ***– P3***

In the debriefing session, a low-vision participant also noted that they would enjoy learning more about the backgrounds of their fellow participants. P4 noted that after hearing about S3's background as a software engineer, they would be intrigued to learn more about the background of their partner and others present within the workshop.

Materials

The materials were very integral to the workshops, which is why materials comprises its own theme. The type of material and how it is used is an important contributing factor to the success of a design. This main theme is comprised of three sub-themes including material usage, material benefits, and material suggestions.

Material Usage

Participants were observed using varying amounts and types of materials. The most used materials included Play-doh, tape and felt pieces, with more than half of the pairs using them in their designs. The stick-on gems were also observed to be useful, one participant used them as Braille and another as a number keypad. As for material organization, two participants explicitly stated that they laid their materials out on a desk or table for easy access.

> *"And I had like, laid them out on my table. So, I knew where everything was" –* ***P4***

Overall, participants had positive experiences with materials and believed there was a decent amount and type of materials, with some notable exceptions mentioned in the materials suggestions section.

"I think that it was useful because there was a good variety of products and a good amount of everything as well. So, you know, should we need to build on anything or create our own shape I think that would have been available or easily." – ***P3***

Some participants used materials of their own. P2 used pieces of colored tape(not pictured on final prototype) and black permanent markers. P4 also used colored tape (not pictured on final prototype) and lined paper to write text.

"I did use of my own stuff, like I had paper, just for like, we want to write some of the you know, just to show that there was text or whatever." – ***P4***

Material Benefits

Participants reported many benefits of using the materials during the activity. Sighted participants said that the materials were easy to differentiate during the video call and helped give them a way to communicate with the blind partner. Some blind participants said that the materials helped them establish a mental model of what they were designing, and the different materials were helpful for distinguishing features of the prototype.

"And like the different medium materials to help with like a visual contrast." – ***P2***

"I think the materials for me was useful for me to use because I was able to get like a really visual picture of how it would look like on the screen because- like [how] landscape mode works in comparison to portrait mode. I guess you can ... it kind of gave me a better sense of where items would be and how it would look visually to enable me to kind of help to figure out different solutions to address different user groups that might have problems with certain software." – ***P1***

"Once we were engaging in dialogue, it became really easy to realize that we had common ground and language and having the tactile stuff also really aided in us being able to work together." – ***S2***

One sighted participant noted that the materials may have been initially easy to understand but could change depending on the complexity of the solution.

"But also, we were trying to make the application simple. That's why we didn't use a lot of things, probably, if complexity increase you know, there might not be enough." ***– P5***

Material Suggestions

Following the conclusion of the activity, blind participants noted some suggestion that they had regarding the materials. The most common complaint amongst blind participants was regarding the selection of adhesive materials. Participant gave suggestions to use glue or Velcro as an option to replace tape that may be easier to use and require less manipulation.

"I was thinking of other way, instead of using tape, I could be the glue. That tape was giving me problems" – ***P5***

"The only thing I would say would be more helpful is maybe a better way to like attach stuff, just because sometimes it's hard to get like the tape to stick to the playdoh. But other than that, it was good." – ***P2***

"[A glue stick may] add maybe another option for those might have more challenges, but probably not the like the actual glue that you like squeeze and stuff cause that would get messy." – ***P6***

In addition to the adhesive suggestions, participants had other suggestions which included a more efficient method of organizing the materials within the envelope instead of in a sandwich bag. Another was to include a message to participants that scissors may be needed. Two participants were observed looking for scissors during the activity.

Closing Thoughts

Overall Opinion of Experience

A majority of participants, both sighted and blind all expressed having a positive experience throughout the workshop. Many stated they had fun and enjoyed the process of creating a solution and working with blind/sighted partners.

"I have to agree, working with sighted people was actually kind of nice. Because sometimes it's kind of difficult to relate to them." – ***P1***

"It was pretty interesting because I've never really worked with people with low sight or poor visibility." – ***S5***

A blind participant stated the experience was positive as they had never had a chance to do something like this and it provided them a new and different perspective for them.

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*"This was great, because it allows, you know, the user to be part of the design experience. And this is something really new for me." – **P5***

Advice

At the close of the workshop, researchers asked participants if they had any advice for the next round of workshop attendees and if they had learned anything they would share. Overwhelmingly, blind participants shared that you should just have fun, be creative and try not to stress and overthink the process. Additional, blind specific advice included having faith in your experience to inform your design choices and find a place where you can work and organize your materials efficiently.

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*"[D]on't underestimate what you thought of. Because you're the expert in this regard. You, the disabled person, are the expert in how to help yourself." -**P3***

*"But if they could find and organize their stuff a little bit more, I feel like- I felt like I had control of myself. But when it came down to it, I was like, looking for things and you know, say, one second even though [S6] was patient about it, I think, like kind of, having a systematic approach to your, to your tools would be really helpful to, to whoever's participating." – **P6***

Reflections

At the conclusion of the workshop, I asked participants to reflect on their overall experience. Participants shared their insights and takeaways, suggestions, perspectives, and what they learned during their time in the workshop.

There were a variety of insights and takeaways that sighted and blind participants expressed. For blind participants, they shared how they learned about the design and development process for apps and digital services and learned more about the visual perspective of apps.

"This activity kind of helped me kind of understand the kind of processes that developers have to go through to make sure that their apps are like accessible, because it never really occurred to me to think about, like some issues that might arise with certain kinds of apps or how you can solve it. So that was a pretty good tool to use probably in the future." – P1

As for sighted participants, their main takeaways involved learning and understanding the importance of inclusivity and accessibility. S3, a participant with prior experience in software design, reflected on how he approached development projects.

"Before [the workshop], I didn't realize, but after I realized, I generally get experience to make prototypes or applications for general [population], but I didn't before work with people who has some disabilities like sight-seeing… you should have in your mind that- to know who you are doing this application for." -S3

After working with their sighted partners, there were a few items that blind participants felt that their partners should know. While observing the pairs working to complete the design activity there were several cases where blind participants had to explain what different assistive technologies were and how they worked. Assistive technologies that were discussed were screen readers and Braille refresh displays. Two blind participants noted that they wished their partner had a basic understanding of screen readers and "how they worked in an asset". An additional blind participant, P4, noted that their partner expressed a genuine interest in learning about assistive technology and how it worked.

When relaying their experiences working with their sighted partner, both P5 and P6 expressed some frustration with how easily their partner seemed to agree with what was happening or give up explaining their ideas.

"I would say the same and try to know exactly what they want to express, for example, he was telling me to do a button… He said a triangle, I was telling him, "Okay, so where should I point a triangle?" And, and he basically said," Okay, how can this matter?" And I would prefer him to say, "Okay, I don't think this could work" or then say, "Okay, I think this could work." – P5

"…for them to just kind of like, give up or not- not believe in the ability of a blind participant would be more discouraging." – P6

Furthermore, P5 and P6 wished that their sighted partners would express their opinions more directly instead of easily agreeing with everything. They wished that their partners would be more explicit about their feedback and critique what they were currently doing.

. .. [I]t's okay to just say, "Okay, I don't like this". Like we're adults, you know, I'm not going to [be] mad for that. – P5

Another aspect that blind participants stated they wish their sighted pairs were aware of is how blind and low-vision people perceive the world and what their priorities and experiences are.

"Yeah, for them to have knowledge of us. How we perceive- what we perceive things as- we, what we give, like, priority." – P5

During the debriefing session, two low-vision participants (P3 & P4) in the same session, brought up the idea of how the use of simulations could help designers make the technology accessible. P4 discussed how blindfolds or vision filters could be useful in understanding how people with disabilities experience the world. P3 agreed, adding on that you should at least attempt to use or test something from the perspective of a blind/low-vision user to ensure that the piece of technology is accessible.

I think that's a great idea. Because you know, you can cover all the bases, but if you haven't, like at least attempted to try to use it from the perspective of the person, then you'll never be certain on whether or not it actually works. Like, you know, you can label all of the buttons. But did it actually work? Did it go through? And we tried it with VoiceOver? So yeah, I think that's a great idea. – ***P3***

It is important to note that while the participants said that they would be open to designers using simulations, they emphasized that it would still be important to involve a blind person in the process.

*First and foremost, I'd say always use the person, but if the person's not available, I think trying to simulate would also be acceptable too. -**P4***

Working with Zoom

As the workshop was conducted through Zoom, I noticed a few prominent issues, discovered through both transcripts and observations. The sub-themes mostly revolved around issues from sighted participants.

Most of the sighted participants complained that they had no knowledge about what was going on with the prototype most of the time and felt their contribution was impacted due to the lack of in-person connection. The felt they had to build a mental model of what was happening to have some understanding of the progress prototype. From observations, sighted participants would often gaze away from the camera, or showed signs of being distracted while long pauses occurred while the blind participant was working.

"Part of it was difficult, because I had to do a lot more like imagining what was going on" -S1

"I think the distance- like doing that from zoom on the other side, like she's prepping the prototype, but I didn't see why she was actually preparing. When she is done, she

were able to show me. This make it a little hard, because when you make the prototype, it is good to be together to be able to see the process as well. I couldn't see that." – S3

To address this issue, blind participants would use descriptive language and constantly communicate to their sighted counterpart, as mentioned in the Language and Communication sub-theme. Sighted participants also had their own suggestions to solve the issue, which included using an additional camera.

"It would have been kind of helpful to, like, point his camera down to where we he was working. Like for the working on the interface, the prototype, it'd be helpful to see what he was doing at that moment. But that might be a little difficult for him." – S5

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8 Discussion

My study used design workshops to explore how to support blind and low-vision people in the creative environment and how to make the design process more accessible to them. Additionally, it provided insight on what simple and inexpensive craft materials may be a suitable replacement for traditional pen and paper sketching.

The workshop placed the blind participants in a position of authority during prototype creation. As stated in the findings many of the participants worked together well and overcame many of the initial challenges of communicating and collaborating with each other. However, even though participants stated that as the process went on, it became easier to work together, this suggests that there may be an opportunity to transition from hesitant teamwork to an efficient partnership. One participant noted that they would have been interested in learning more about their partner's background and experience, perhaps spending more time to allow pairs to build and strengthen their working relationship would allow for a faster transition to familiarly and effective collaboration. Ideally, in a user-centered design methodology, designers and developers would have an extensive working relationship with end-users as they design, brainstorm, and evaluate ideas together. Increasing the amount of time spent together would build trust and hopefully create an open environment to share ideas and opinions. It could also help to establishing opportunities that allow the pairs—or all participants—to interact with each other early on within the workshop, so that they can become more acquainted with each other and reach an ideal state of partnership quicker.

Pairs within the workshop often equally contributed and acknowledged each other's ideas and suggestions. This finding contradicts the dominant group members who were observed speaking over everyone and making most of the decisions in Brewer [9]. It is possible that the smaller group size of two, rather than the larger groups of four or more of the other study [9] helped mediate the potential issues that may arise with dominant group members. However, in the case of one the workshop pairs, there appeared to be a blind group member who felt that their ideas were not prioritized but at the

same time seems to have control of the conversation. This could be the potential result of the differences in the blind and sighted experiences. It may suggest that even if a blind participant has the lead, it could still be overshadowed by a sighted bias. Furthermore, results showed that participants with experience had a different mindset when approaching the design activity, with participants who had experience creating practical grounded prototypes. This could mean that backgrounds and experience could have a significant impact on how pairs ideate and the solutions they create. Participants who have experience may have a set workflow in their approach problem solving, while those without prior exposure, are not held in a similar pattern of thoughts.

Overall, the materials present were favored by participants. Blind and low-vision participants noted that the materials were useful in building their design solutions and even helped them establish a mental model of digital applications and, which was initially lost to them. This suggests that these materials may be a cheap and inexpensive alternative to potentially expensive, technologically advanced, and inaccessible design tools [11,14]. However, not all materials were well liked, such as the tape. Further exploration into potential alternative adhesives would be beneficial. Possible alternatives could include glue sticks, double sided adhesive dots, and poster putty.

Blind participants expressed an interest in having sighted participants learn about experiences and assistive technology and a few sighted participants showed interest in learning about assistive technology. To address both issues, there can be an additional training session in which sighted participants are educated on the lived experiences [4] of blind and low-vision people. This could create a more supportive environment for collaboration as the blind participants are not forced to educate and can focus on creating a design solution. Furthermore, a training session for sighed people could mitigate their fears of using insensitive language and potentially offending their blind counterparts. This fear of offending was also a finding from another study in which designers were surveyed on their use of simulation of visual disabilities in the design process [21]. A training session specifically targeted to sighted people may have a positive impact in how participants of differing vision statuses interact and potentially create an environment in which the blind participant is not placed in a position to educate but design. Another aspect that the training session could address is the sighted participants who were observed to quickly agree or give up explaining their ideas. This finding suggests that sighted people are not used to conveying visual information in a way that does not rely on hands-on manipulation of materials or gesturing to locations. Training sighted people or giving them an opportunity to practice and fine-tune this skill ahead of time could allow for more effective communication in the design workshop. It should be noted that sighted participants with no experience in design and user-experience were the ones observed to fear using insensitive language or be hesitant in giving critical feedback and explaining ideas. This further supports the idea of a training session as it would allow sighted participants the ability to practice and become familiar with these skills.

There was a blind participant that showed instances of self-doubt and lack of faith in their design skills. This observation may suggest that the training session for blind and low-vision participants may not have been adequate. Blind and low-vision participants may need more training and experience to feel confident in their skills which echoes the meeting I had with two blind researchers regarding the premise of my study. It is important to note that only one blind participant relayed this sentiment, which could also suggest that the training session was sufficient for other blind/low-vision participants.

Participants note that using simulations may be a feasible way to make sure things are accessible. This however contradicts points in Bennett and Rosner, that designers who use blindfolds or other simulation techniques may not simulate a blind person's experience but rather a sighted person's experience wearing a blindfold [4]. Additionally, Tigwell shares findings of how people with visual disabilities initially were on board with the use of simulation but later changed their opinions after learning more about how the process works, or were okay with the concept, but only under specific conditions, such as a person with a visual disability guiding the process [21]. The cause of these differences in opinions could be two-fold. The first is that the participants who expressed their ideas with using simulation were not expressly told on how designers use simulation during the design process, which could possibly change their minds, as shown by Tigwell [21]. Secondly, the participants who showed support for the use of simulation were both low-vision, this opinion could differ from completely blind people. It is also important to note that blind and low-vison people are not a monolith and while some may agree or disagree with the use of simulation, their opinion may not be representative of the whole population.

Many participants remarked that they enjoyed the workshop and had an overall fun experience completing the design activity and working with a blind/low-vision or sighted participant. Additionally, participants felt that they finally had an insight on how the development process worked and what it was like to be a contributing member within the process. This finding suggests that blind and low-vision people are open to being contacted and working with developers and designers in the product development cycle. This further supports the work of Tigwell [21], in which blind participants advocated for designers to reach out to the blind community to help test products. Blind and low-vision individuals may be more than willing to get involved with the design process and this could lead to products and applications being more inclusive.

Sighted participants advocated for the implementation of an in-person workshop and there were no instances of blind participants sharing the same idea. The reasoning behind this was so sighted participants would be able to directly manipulate the prototype and directly see the progress of the prototype while it was being made. While an in-person workshop could relieve the frustration of not knowing what is going on for sighted participants it could possibly shift the power dynamic in favor of the sighted participant. The nature of the remote workshop ensured that the blind participant would, in the end, make many of the final decisions since they were the ones with the materials. One observation of the workshop saw a sighted participant suggesting arguably minute and insignificant changes for material placement. This could be exacerbated in an in-person workshop. If an in-person workshop were to take place, I would recommend that the materials remain in the hands of only the blind/low-vision participants. As stated previously, I do foresee issues with the sighted participants micromanaging the prototype creation. However, these concerns may be unfounded, which is why any iterations of an in-person workshop should be piloted to better understand how the power dynamics would play out rather than basing decision on assumptions.

In addition to the in-person workshop, sighted participants also suggested either using an extra camera to see the progress of the prototype or readjusting the web-camera for the same reason. Again, this raises potential concerns in making it the blind and low-vision participant's burden to accommodate their sighted partner. As stated previously, this could also shift the power dynamics in the sighted person's favor.

There are a few things that I would suggest to answer the research questions proposed previously.
To support blind and low-vision people in creative environments:

1. Allow blind/low-vision participant ample time to become familiarized with any materials they will use and potentially conduct a practice session. This could allow them to feel more confident in their design skills and abilities.
2. Educate sighted counterparts on blind experiences ahead of time. In doing so, it will put less of a burden on the blind participant to explain the technology they use and the things they prioritize and create a more productive partnership as time is not wasted by frequent explaining.
3. Create a path for blind and low-vison people to participate in the design process. My study shows that they enjoyed the experience, they just need an opportunity to do so.
    a. Conducting more workshops, such as the one presented in my study could be a viable solution.
    b. Creating a relationships with technology companies and interested blind designers and developers to have an active role in the designs is also an option.

The best materials to use:

1. Tactile materials that are easy to manipulate and work well together.
2. Tape may not be the best choice of adhesive.
3. Ensure that materials are already precut and do not require further adjustment, such as cutting something in half with scissors.

Best practices in running remote workshops with blind and low-vision people:

1. Ensure that all materials needed are organized separately and neatly.
2. Be aware and mindful of the different backgrounds and experiences of participants. For blind participants it may be their first exposure to the concept of sketching and for sighted participants it could be their first experience working with blind or low-vision people. It is imperative that facilitators are mindful of these differences and create an environment in which they can be used a benefit to the process.
3. Provide notice that participants may need an open and clear space to work and a few potential materials they may have in-home to use.
4. Reassure participants that it is okay to have fun and be creative. The workshop is not a test of their skills or aptitude.

9 Challenges and Limitations

The design of the study presented a few challenges and limitation and the first being based on materials. Materials needed to be shipped out to participants but due to delays no participants received the materials in time for the training session, which limited their interactions and familiarization with the materials. Participants were encouraged to interact and check out the materials but not everyone did. Further, it was difficult to assess how valuable the training sessions were to blind and low-vision participants. Future iterations should take care to ask participants about their opinions in how training sessions prepared them for design workshops. Additionally, the training sessions were not included in the analysis, but it could be insightful to compare the behaviors and artifacts produced in the training sessions and workshop. This comparison could provide additional information on whether the training session was helpful.

The study was conducted remotely via Zoom, which prevented participants from directly interacting with each other. Due to the virtual setting, it was also difficult for blind and sighted participants to share

ideas since they were limited to the small view of the camera and visual descriptions. Many participants, mainly sighted, advocated for the inclusion of an in-person workshop. Conducting an in-person workshop could provide additional insights on collaboration between blind and sighted designers.

I also did not analyze the individual design solutions and creation in terms of vision status. There could have been interesting findings based on how low-vision or totally blind participants utilized materials. There is a distinction between the two which should be acknowledged as some materials may be more suitable to low-vision participants and not blind participants. Additionally, design solutions should be evaluated in terms of how successfully the prompt was addressed. The study briefly discussed the designs, but a more in-depth assessment should take place in future work.

The experience levels of participants may have been a limiting factor in the study. There were varying levels of knowledge from both blind and sighted participants, with all blind participants having no experience and three sighted participants with some. There was no control for experience which could have impacted how the design solutions were created and interactions between participants. Future work should pay close attention to experience levels and its potential impact on produced artifacts.

Most sighted participants were college aged students. If the study recruited a diverse range of occupations and age ranges, it could have produced more generalizable results.

10 Conclusion

The investigation showed the experiences of both blind and sighted designers completing a design activity as pair. Findings showed that both sighted and blind participants had positive experiences in attending the workshop, and that communication and language were notable themes in the data because their partnership. To help support blind and low-vision people in creative environments, my findings suggest that educating sighted people on the experiences, priorities and perspective of blind people and the assistive technology they use could be beneficial. Additionally, my results suggest that the materials used for workshops, apart from tape, were useful in creating design solutions that were understandable to the blind and sighted designers. Future work could further explore how different backgrounds and prior knowledge could impact design solutions and explore conducting in-person workshops.

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13 Appendices

Appendix A: Prompts

Grocery Store

Context: More and more consumers are using grocery delivery and pick-up services, such as Instacart. The increased use of these services often highlights the problems with the usability of these applications.

Scenario: Shoppers use a mobile app on their phone, browsing product listings and adding items to their cart. When shoppers come across an item of interest, they can learn more before adding it to the cart and deciding to buy it. Consider that the shopping process may involve selecting the desired item to learn more about it, adding it to the cart, and then viewing items in the shopping cart.

Keep in mind important actions that a user must take. IIncluded but not limited to: going back and forth between selecting to view information, adding to cart and completing checkout, removing or adding items from the cart, and adjusting an item amount.

Museum

Context: Visiting museums and being able to appreciate the art, artifacts, and historical objects is a great way to spend a day learning. However, it could be a major challenge for people without any background in fine art, interest in history, or if the information is delivered in an inaccessible way. To make the exhibits accessible and engaging to the public, some museums provide tactile or auditory feedback as alternative ways to access the information. However, it is important to deliver that information with an easily understandable format and avoid substantial cognitive efforts.

Scenario: The majority of visitors usually have an overview about museums through their booklets, which cover the categorization of collections, special events, and the historical background. Alternatively, people use their mobile devices to access this information through scanning QR codes or applications designed for the museum. With the materials given, please design a mobile device interface to share the information of one collection.

Keep in mind important information that a user could access or may need to fully enjoy the museum. Included but not limited to: collection name, artist name, years, background and location in the museum and other information deemed.

Appendix B: Questions

Guided Discussion

- How has your relationship with technology changed over time?
- What are your favorite/least pieces of technology and why?

Activity Wrap-Up

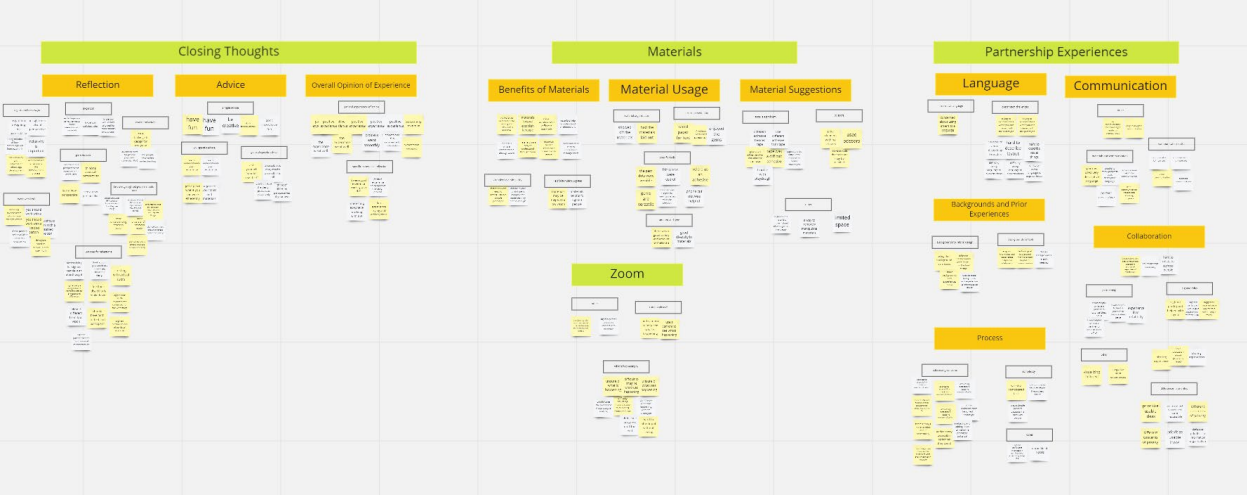
- How well do you think the activity went in terms of finding a good solution?
- What challenges did you have?
- Collaboration/Communication? What was it like working on Zoom?

- How were the materials useful? how were they not useful?

Debriefing

- How is your experience working with sighted people/Blind and low vision people?
- Based on your experience, what do you think sighted people can do to improve experience?
- what suggestions do you have for us for the next round?
- What advice do you have for participants in the next workshop?

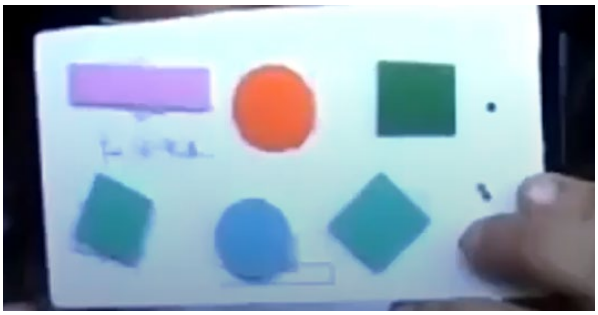
Appendix C: Codes



Link to View Board: https://miro.com/app/board/o9J_lkTn_Fw=/?invite_link_id=219283128418

Appendix D: Workshop Artifacts

(Figure 3. Portrait View)



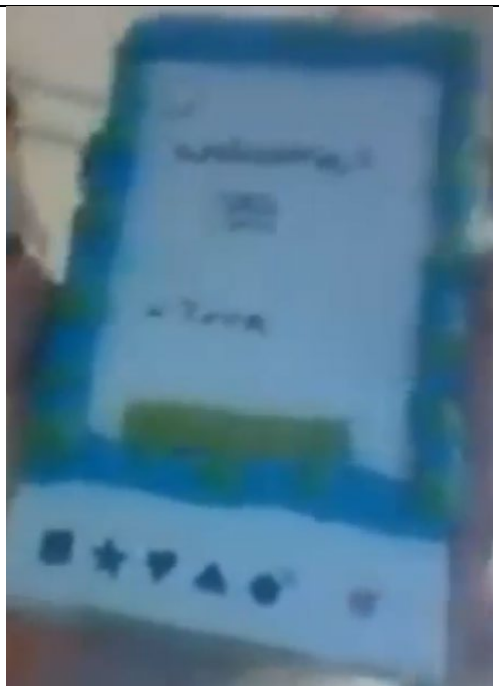
(Figure 4. Landscape View)

Participants: P1 (Blind w/ Light Perception) & S1
Prompt: Grocery Store Delivery
Description:
Pair 1 created a browsing page with " two options; landscape and portrait mode, because landscape old might enable you to take more advantage of the screen real estate."

The pink rectangle present in both figures is the search bar. The writing underneath the search bar shows if someone already searched something then searched for an additional item.

The circles represent the items different items that would be listed in the app. The squares depict a button that when pressed will show a little description of the item without navigating to the item's page.

(Figure 5. Back of prototype)



(Figure 6. Front of prototype)

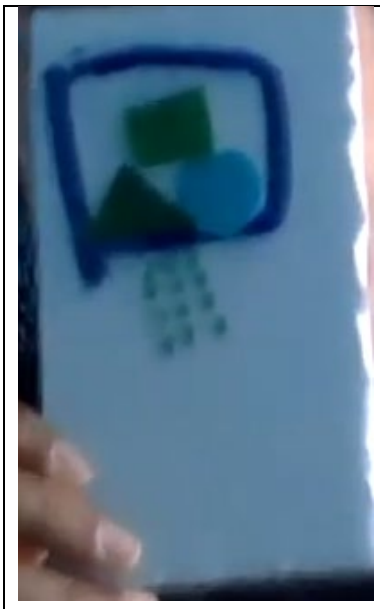
Particpants: P2 (Low-Vision/Legally Blind) & S2
Prompt: Muesum
Description:
Pair 2 created a prototype that makes the museum experience inclusive and accessible to all.
The different shaped buttons on the bottom represent:

- Tutorial
- Bathroom location
- Popular exhibits
- Guided tour (if you are alone or have social anxiety)
- An emergency button

The smaller bottom of the prototype is a touch screen, but the top portion is not. On the sides there are buttons (as you can see in Figure 5)" where you can change the volume or to switch between captioning and turning on the other accessible features."

The prototype does not switch to landscape mode. On the back is an attachment, "so if you have a prosthetic limb or in a wheelchair, or if you're elderly and have arthritis, you can either hold on to it or attach it to what you need it to attach to"

The pair doubled up the phone cut outs to represent additonal protection. "You don't have to worry about dropping it. And we doubled up the smartphone cutouts just to make it thicker for maybe people with arthritis or young children who might be worried about dropping it, just like a protective layer."



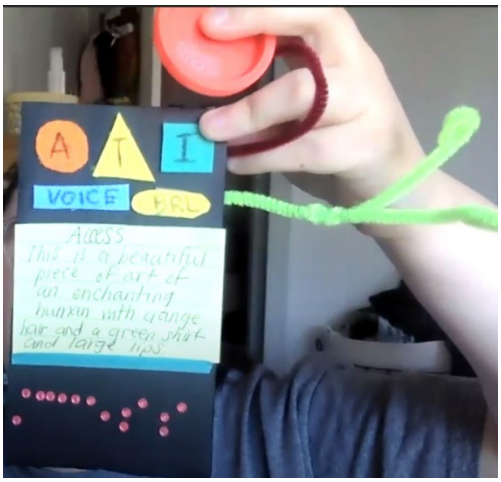
(Figure 7. Pair 3's Prototype)

Particpants: P3 (Low-Vision) & S3
Prompt: Musuem
Description:
Pair 3 created a prototype that is somewhat similar to audio devices that are given at museums.

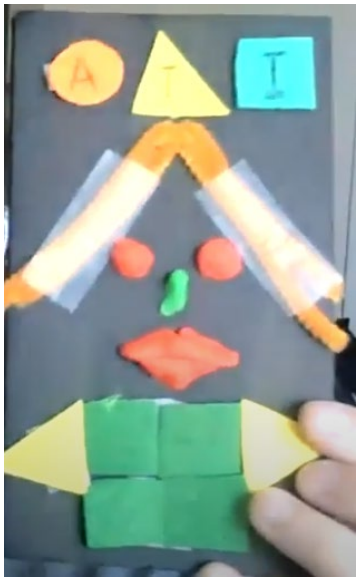
The prototype as pictured in Figure 7 represents the starting page of their app.

- The bottom right circle represents a camera button
    - You can scan QR codes of objects and text and pictures related to the object will appear
    - An audio option will also appear if you are unable to read or see the text and pictures
- The triangle represents the menu button
- The square represents the search bar.
    - You can search an object within the museum even if you are not present in the museum

The gems organized in a grid pattern is a number keypad that can switch to a keyboard if needed.



(Figure 8. Text and Braille Version of Prototype)



(Figure 9. Image Version of Prototype)

Particpants: P4 (Low-Vision) & S4
Prompt: Musuem
Description:
Pair 4's goal was to create a prototype that would be accessible to a large range of people.
The three shapes at the top represent different means of communication. The circle is for audio, the triangle is for text, and the square is for image.

- When you select audio, you have a choice of different languages.
- When you select text, you have and option to switch between long or short descriptions of art pieces (see Figure 8).
- When you select image, you of the option between a flat picture or a tactile option as pictured in Figure 9.

If you select the rectangle for voice, you have the option of voice control to access different parts of the prototype. If you select the oval for Braille, the bottom of the screen will act as a refreshable Braille display. On the prototype "access is spelled out in Braille (see Figure 8).

The green pipe cleaners represent headphones, and the red pipe cleaner with the playdough lid represents a switch for people with motor impairments.

(Figure 10. Physical Museum Navigation Prototype)

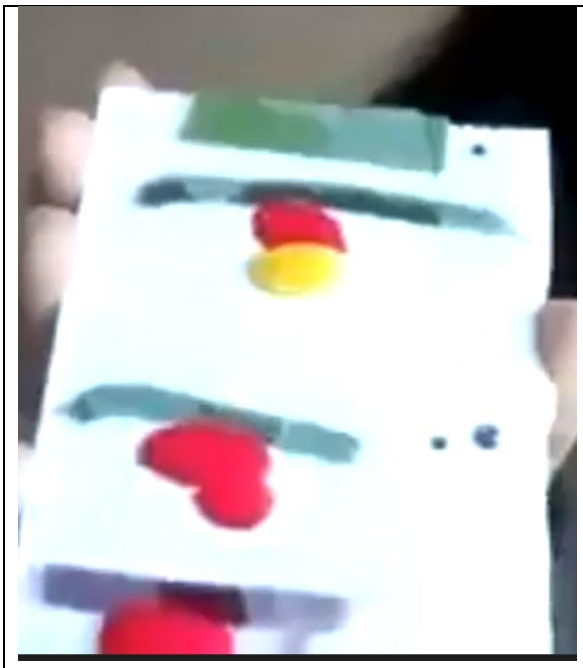
(Figure 11. Museum App Prototype)

Particpants: P5 (Blind) & S5
Prompt: Musuem
Description:
"And we identified two problems. The first problem is users getting around the museum. And the second problem is users getting access to the actual pieces of art. So, we divided our prototyping into two parts"

Figure 10-
A blind user would use a cane to feel for the main aisle line. If it turns into another direction, that indicates there is an exhibit in that area. The circular play-doh dot would be a change in texture on the ground " that indicates the user, they can touch that piece of art"
In addition to what was displayed in the prototype the pair said that there would be motion sensors that would announce the exhibit that a user was entering. There would also be flyers/plaques around the museum with Braille.

Figure 11-
The companion app has "different squares like the felt squares that indicate the pieces of art. We have the pipe cleaners will be text that is designed to show users information about it, we have a square button, the bottom will be asked for help. And the triangular button will be directions".
At the top there is an oval/square shape that represents a pull-down tab where a list of collections will be hosted.

The compass is a guide for users and will let them know where they are in the museum. " It will use the Bluetooth and all that stuff… So, it will use the sensors that everything though, we could include to help the user navigate around it, and let them know where they are"



(Figure 12. Pair 6's Prototype)

Particpants: P6 (Blind) & S6
Prompt: Grocery Store Delivery
Description:
Pair 6's prototype was a depiction of the shopper's experience of the browse page for gorcery delivery.

Organization of the overall prototype was made to be "top to bottom" with "not a lot of things side to side, unless they're just buttons, we decided those would be really fine, just because if they're labeled properly, it really doesn't matter where on the page they are, as long as we can understand what they are, and being able to find them with a screen reader"

The rectangle at the top is a search bar with the search button represented as a gem to its right. Text is presented by the pipcleaners and the play-doh pieces represent information about the product, that would initailly be hidden in a drop down-menu.

A user can adjust the quanity of items, as indicated by , "the two dots beside the text is for adding and removing the items from the cart."