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Empowering the Visually Impaired, Enabling Independence.

Visual impairment can significantly **impact daily activities**, hindering independence and mobility.

Clearview is an innovative app paired with smart glasses, designed to **enhance vision** and empower users to navigate everyday tasks with confidence and autonomy.



RESEARCH

CHALLENGES

Individuals with vision impairment are also more likely to experience restrictions in their independence, mobility, and educational achievement, as well as an increased risk of falls, fractures, injuries, poor mental health, cognitive deficits, and social isolation.

INCLUSIVE TECHNOLOGY IN SCHOOLS

We were able to find several technologies that helped to benefit students such as:

- Screen Readers
- Camera Scanners, OCR and text -to-speech
- Daisy Player
- Braille displays and notetakers
- Screen magnification
- Graphing and Maths Technology

This helped us to understand what kinds of technology was currently available, their pros and cons, as well as identifying areas that have gaps or need improvement.

FINDINGS

EXISTING TECHNOLOGY

- Braille Keyboards
- AI Smart Glasses
- Audio Labelers

USER'S NEEDS

- a product with tactile features
- ease of navigation - with app and physical product
- an audio aid to help guide them through their life

LEVELS OF VISION IMPAIRMENT AMONG OUR USERS

Mild vision impairment

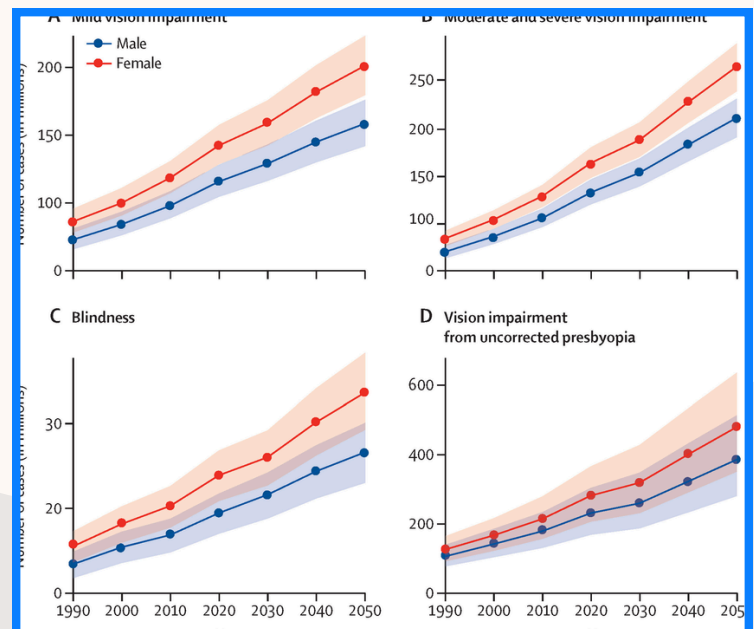
There has been a significant increase in females visual impairment, while there has just been a steady increase in men.

Moderate & Severe vision impairment

There has been more reported people with severe vision impairment, showing females are still the majority.

Blindness

While the amount of blind people have been increasing it is a lower percentage of the visually impaired community.



RESEARCH

IMPROVEMENTS FROM THE WCAG GUIDELINES

WEB CONTENT ACCESSIBILITY GUIDELINES

PROS

- Text to speech when hovering
- Alt text
- Simple design with big text, allowing users room for error
- Speaks to users about next steps to follow

CONS

- Complicated interface
- Not screen reader friendly websites
- No flow in websites, difficulty following the actions
- No alt text, leading to visually impaired users not understanding the text related to the picture

INSIGHTS

- Make our app more accessible for the visually impaired by making simple designs, and making it easy for screen readers to read all of the information

OBSERVATIONS

OBSERVATIONS

Along with our research, we wanted to come up with a few hands on observations to help give us inspirations for prototype ideas. Initially we wanted to create a prototype with visually impaired students as the target user group.

In-Class Observations:

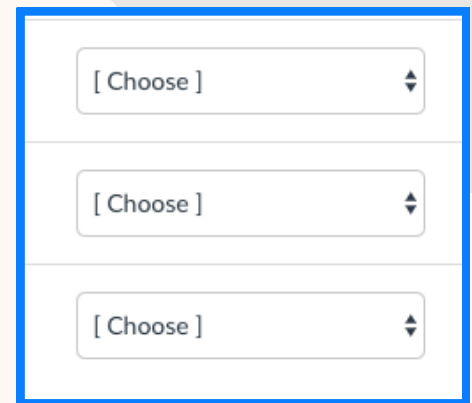
- Teachers often do not say what they write word for word
- Difficulty understanding concepts that use diagrams or pictures

Public Observations:

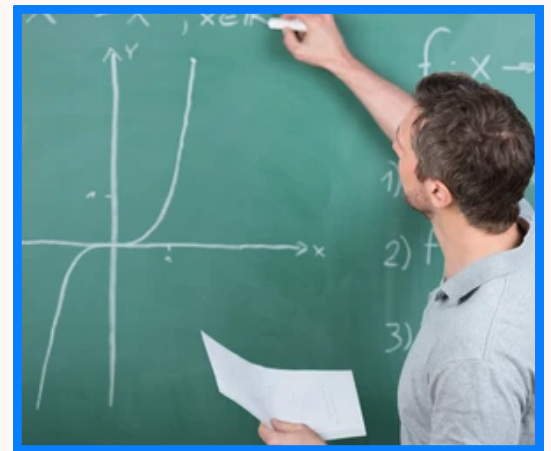
- Difficulty reading menu, checks, and signs without braille or text reader
- Navigation apps do not warn of stairs or potential other hazards

Blindfolded Canvas Quiz:

- Screen readers have difficulty processing drag and drop and matching questions and also struggles to read drop down answer choices
- Time limits for tests and quizzes makes it stressful and difficult when there are technological difficulties



Screen readers cannot interpret drop down answer choices



Difficulty seeing and interpreting graphs and diagrams on whiteboards and chalkboards

INITIAL IDEAS

IDEAS

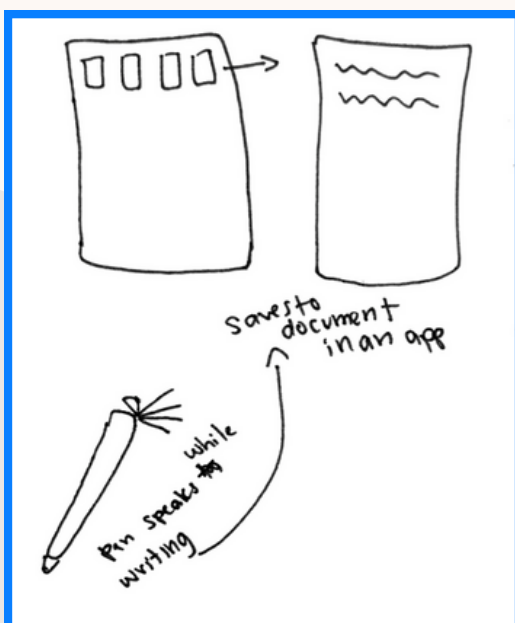
Following our observations, we brainstormed several iterations of ideas and eventually narrowed our ideas down to three concepts. Our ideas were focused to fit a broader user scope rather than just visually impaired students.

SPEAKING PEN IDEA

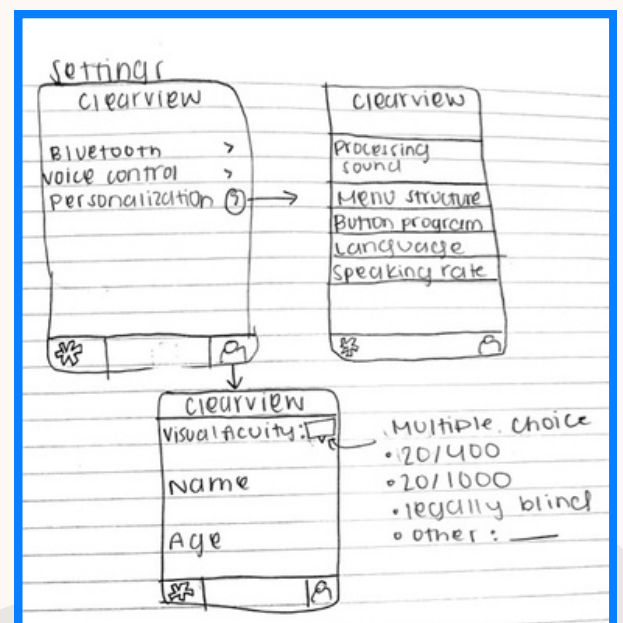
Our first idea was a pen that speaks as it is writing, intended for teachers to use and for visually impaired individuals to follow along and listen to what is being written when teaching. This idea stemmed from the difficulty of not knowing what teachers are writing while teaching.

SURROUNDINGS APP IDEA

Our second idea was an all encompassing scanning app that would allow a user to take a picture and for the app to read out any words that had been identified. This idea was created in hopes of reducing the difficulty for visually impaired individuals when needing to receive visual information from words.



SPEAKING PEN



SURROUNDINGS APP

FINALIZED IDEA

INSIGHTS

We analyzed all of our ideas using a concept chart to assess each idea's desirability, feasibility, and viability.

In summary we found:

- A talking pen would be difficult to prototype
- There were similar talking pen products that already existed
- A scanner app would be difficult to use since it relied on touch screen functions
- Scanner apps such as Google translate already exist to scan and read text
- The ideas' viability did not have a long anticipated lifetime given the rising developments in technology

CHOSEN IDEA

After receiving feedback and brainstorming ways to accommodate for desirability, feasibility, and viability, we developed the idea of **Surroundings Glasses**.

Surroundings Glasses Features:

- Wearable glasses styled like standard reading glasses
- Camera to scan surroundings
- 3 buttons: AI assistance, volume up and down buttons
- User holds down AI button to ask for assistance with a specific task
- AI gives instructions or directions based on the user's request
- Glasses pair with an app for customization and accessibility features
- glasses to allow users an easier way to accomplish tasks
- an app that coordinates with the glasses for customization.

TESTING AND RESULTS

HOW WE TESTED

Our plan: T

- Ask them to do the four tasks
- Have them close their eyes - to reenact the visually impaired
- The director of the test acts as a screen reader - so they are able to navigate through the app
- Observe them complete the task and write improvements based on their feedback

Tasks for the user to complete:

1. Login/sign in to the app
2. Locate your glasses within the app
3. Edit your profile
4. Change the personalization features through the settings

DIRECT RESULTS AND INSIGHTS

We found:

- the button interaction was lacking in terms of spacing and size
- the user ran into dead ends, which limited navigation in the app
- there was a lack of personalization

Changes made:

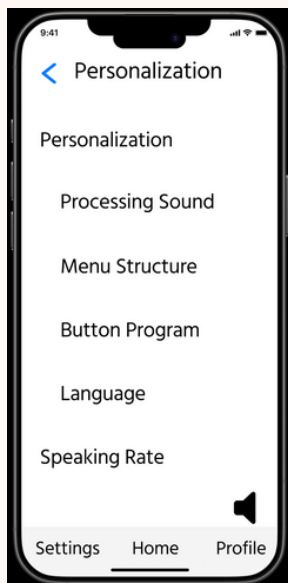
- Increasing button size and layout of the buttons
- better organization of the screens and increasing the flow
- slightly shifting layout and adding screens to prevent getting stuck in a dead end
- adding more personalization

CLEARVIEW

MOBILE APPLICATION

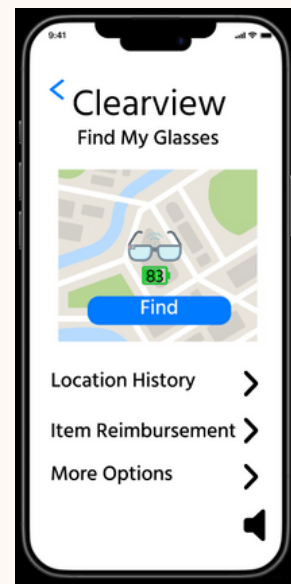
Clearview is a **mobile app** designed to **accompany** glasses that help blind and low-vision users see their **surroundings**. Users can use the **camera** or the **glasses** to see their surroundings, **track** their glasses, and **customize** the app and glasses to their needs within a WCAG-guided interface.

PERSONALIZATION SCREEN



- The different personalization features allow the users to customize to their personal needs.
- It has smart toggles and sliders that people can use to adjust to their personal needs.
- We have added a speaker that will comply with the screen reader and/or just read the text on the page.

FIND MY GLASSES SCREEN



- Have the ability to find the glasses if lost or misplaced.
- If the Bluetooth connection is weak, you can check the location history to see where it was before.
- Tells the percentage of your battery and where it is on a map.
- Can touch the arrow and item name to go to the next screens.

CLEARVIEW

GLASSES



Adjust the volume with the buttons on the side
The speaker will allow the user to hear their surroundings

Low vision users will be able to see the notifications of what is happening in their surroundings, but users with more limited sight will hear the notifications



CITATIONS

“How Important Is Tech to Students with Visual Impairments?” Perkins School for the Blind, 28 Oct. 2022, www.perkins.org/resource/how-important-tech-students-visual-impairments/#:~:text=Mainstream%20tablets%20and%20smart%20phones,continue%20to%20be%20another%20option.

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Sciences, National Academies of, et al. “The Impact of Vision Loss.” Making Eye Health a Population Health Imperative: Vision for Tomorrow., U.S. National Library of Medicine, 15 Sept. 2016, www.ncbi.nlm.nih.gov/books/NBK402367/#:~:text=Individuals%20with%20vision%20impairment%20are,cognitive%20deficits%2C%20and%20social%20isolation.

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