Indepinity: Assistive Technology

Philadelphia Performing Arts Charter School
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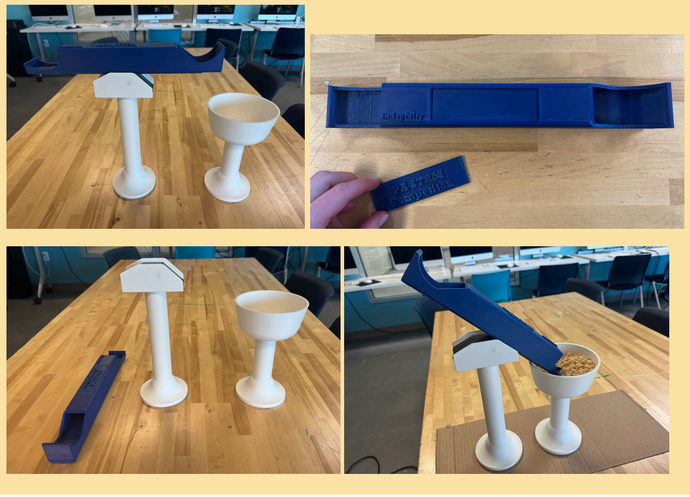
Final Self Feeder



Final iPad Stand

Abstract

- Our team identified the needs of individuals with disabilities, focusing on enhancing independence and quality of life.
- Using Universal Design principles, we developed solutions that were adaptable, user-centered, and modular.
- Through the Engineering Process, we identified problems, brainstormed ideas, prototyped designs, tested solutions, and iterated based on user feedback to ensure functionality.
- We partnered with the Inglis House in Philadelphia, a facility specializing in care for adults with physical disabilities. This collaboration provided insight into client challenges and feedback into the design of assistive devices.
- This allowed us to create innovative, personal solutions that directly addressed community needs.

References

- Thorsen, R., Bortot, F., & Caracciolo, A. (2019). From patient to maker - a case study of co-designing an assistive device using 3D printing. Assistive Technology, 33(6), 306–312. https://doi.org/10.1080/10400435.2019.1634660
- Kim, J. H., Yang, H. S., Han, S. H., Lee, B. M., Lee, Y. K., Sim, W. S., Park, G. S., Lee, S. B. N., & Jo, M. (2022). Application of a 3D-Printed Writing–Typing Assistive Device in Patients with Cervical Spinal Cord Injury. Applied Sciences, 12(18), 9037. https://doi.org/10.3390/app12189037

Acknowledgments & Consideration of Commonwealth

- We partnered with Inglis House in Philadelphia, a nursing care facility for adults with physical disabilities, like multiple sclerosis. They also support non-residential clients and aim to help individuals achieve their goals and live fulfilling lives.
- Inglis has a 3D printing lab that creates personalized technology.
- They introduced us to clients facing tech challenges, and we developed innovative solutions to help not just them, but a broader community. Inglis provided valuable insights into client limitations and feedback on our designs.
- The needs of Commonwealth residents can be addressed through the applications of STEAM. STEAM ensures that challenges are addressed with creativity, science, and technical thinking.
- For example, improving public transit can involve designing energy-efficient systems. Art in transit designs increase community harmony, while science ensures sustainability.
- The incorporation of art into fulfilling the needs of commonwealth residents brings joy to life and science.

Links

Website:
https://www.indepinity.com
Prototype Demo video:
https://www.youtube.com/watch?v=-X9UhoSdaE0
Budget:
https://static.wixstatic.com/media/ad6d36_8e0e83350991456e96a7c5d5d2ab3eca~mv2.png

Engineering Process

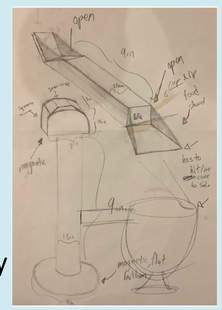
Problem Identification

Self Feeder:
- A client with multiple sclerosis (MS) was having issues with their self feeder. The existing self-feeder required excessive head/neck movement. The client had minimal arm and neck mobility, making their current device inefficient.
- These issues disrupted mealtimes and their independence. The key problems included physical strain and lack of adjustability.

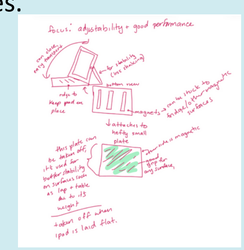
Innovative iPad Stand:
- A client with multiple sclerosis is struggling to use her tablet in her wheelchair and on her desk. Her current stand is unstable, relying on cardboard and a grip mat for support. Due to limited fine motor skills, she often presses too hard, causing the stand to shift.
- She cannot use a regular iPad case because she is unable to prop the tablet independently.

Brainstorming

Self Feeder:
- We brainstormed ways in which the self feeder would be less agitating, while also balancing the client's independence.
- We wanted to include personalizable aspects to it so that the client could feel more connected to the device.
- 3D printing allows designs to be easily modified and reprinted overtime if the condition of the patient changes.

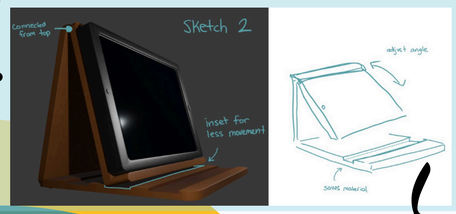


Innovative iPad Stand:
Sketch 1 [Scratched, too many useless components]



Sketch 2: Extruded Ridges

Sketch Finale: Inset



Prototyping

Self Feeder:
Prototype 1:
- This prototype did not have personalizable aspects to it. Some of the prints came out flimsy as well. The next prototype must be customizable and stable.

Prototype 2:
- This prototype was created with high resolution, which made it more stable and safe. The spoon part now has personalizable insert aspect to it.

Innovative iPad Stand:
Prototype 1:
- Limited materials, fabric for comfort and aesthetic, hot glue did not work well. The rod made it work but was weak.

Testing

Self Feeder:
Testing 1:
- The stand and bowl kept shifting. These pieces need to stay in the same place at all times.

Testing 2:
- The edges of the spoon can be rough. This can irritate or cut the client's mouth.

Testing 3:
- Some of the magnetic strips were weak. We must buy stronger magnets.

Innovative iPad Stand:
Testing 1:
- Some of the wood is rough, we should use fabric to cover it.

Testing 2:
- Using hot glue for grip looked tacky and the material was fraying. We might eliminate material all together.

Testing 3:
- Some of the wood is heavy, we will try to use thinner wood.

Iteration

Self Feeder:
- We added grippy material under the spoon stand and bowl to keep them in place.
- We smoothened the edges of the mouth part of the spoon to avoid irritation.
- We bought stronger magnets to keep everything in place better.

Innovative iPad Stand:
- We used grippy material to keep the iPad stand from moving.
- We decided to only use wood and minimal fabric, ensuring to sand the wood to prevent splinters or cuts. This wood is more lightweight.