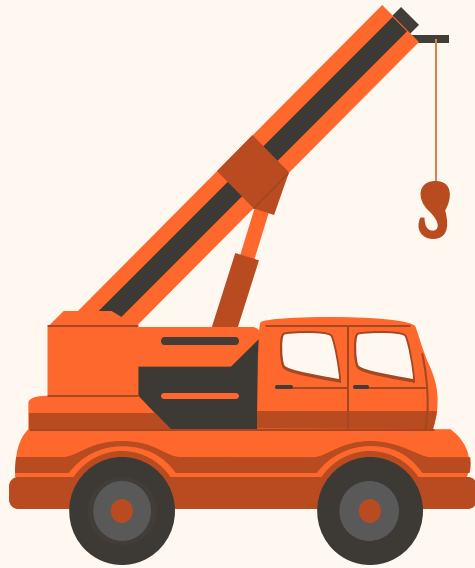


Group 10

Thinker Titans

Benjamin De Vellis, Jennifer Tran, Sana Hosseini, Aaliyah Ansari,
Chaouki Dehane





Introduction (Aaliyah)

Our project on designing a tool for collecting metal samples from difficult-to-reach areas in the nuclear sector. Our journey involved brainstorming solutions, refining designs, and overcoming challenges like budget limits and coordination hurdles. Through teamwork and innovation, we developed a practical and safe concept. This presentation walks you through our process, final design, and key takeaways.



Table of Contents

- 01** Problem Definition
- 02** Initial Solution Options
- 03** Chosen Concept
- 03** Design and Development Process
- 04** Mistakes / Lessons learned



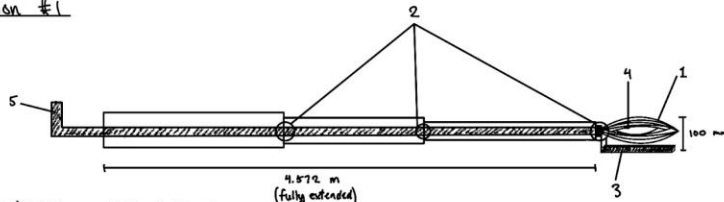
Problem Definition (Aaliyah)

In the nuclear sector, ensuring infrastructure safety in high-radiation, hard-to-reach areas is a tough but essential task. The challenge is to create a sampling tool that can carefully extract a 30-80 mg metal sample from inside a 4-inch diameter tube, positioned 4.572 meters (15 feet) from the inlet. This tool must work in both horizontal and vertical orientations, keep the sample securely contained, and provide real-time feedback. It should be fail-safe, easy to transport, powered independently, allow precise control, and remain durable enough to perform reliably even in the most extreme conditions.



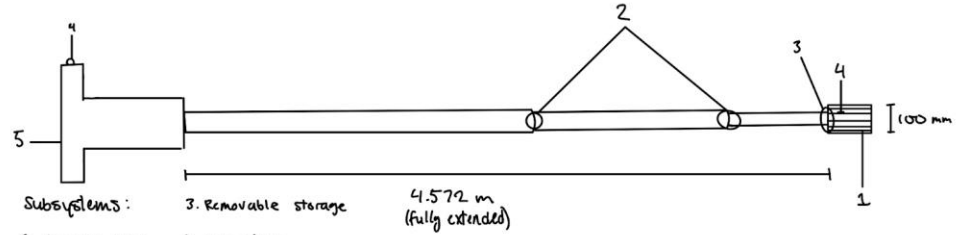
Initial solution Options (Jennifer)

Solution #1



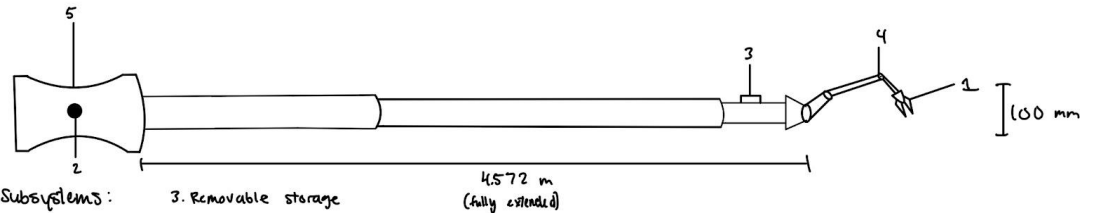
- Subsystems:
- 3. Removable storage
 - 1. Sampling Tool
 - 4. Feedback system
 - 2. Fail-safe
 - 5. Handle

Solution #2



- Subsystems:
- 3. Removable storage
 - 1. Sampling Tool
 - 4. Sensor/LED
 - 2. Fail-safe
 - 5. Handle

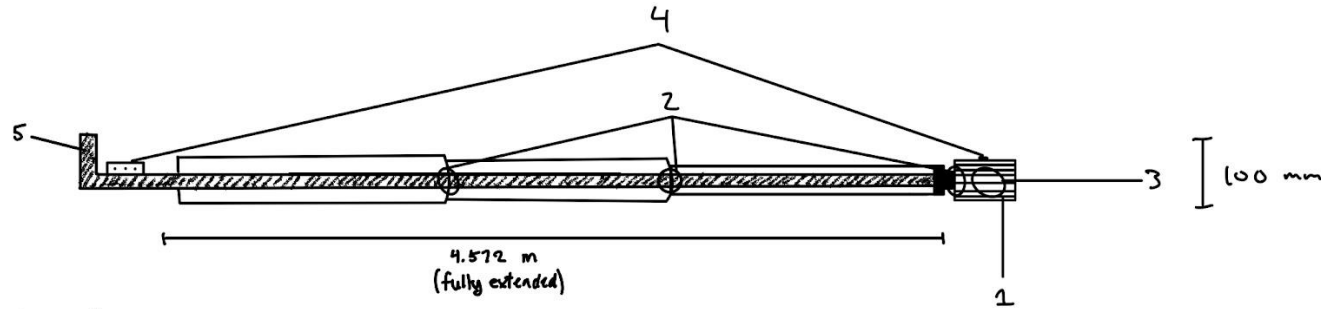
Solution #3



- Subsystems:
- 3. Removable storage
 - 1. Claw arm
 - 4. Camera
 - 2. Emergency stop
 - 5. Handle

Initial solution Options (Jennifer)

Final solution



Subsystems:

1. Rotating collecting scraper

2. Collapsible, detachable components

3. Removable storage

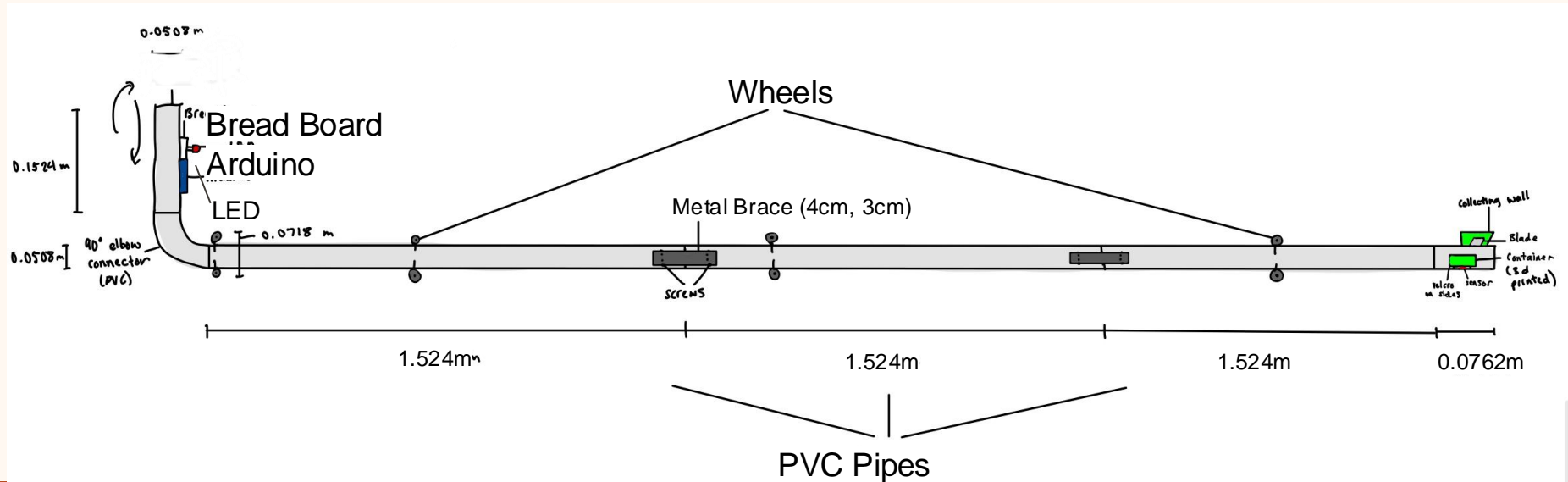
4. Sensors/LED (Arduino)

5. Left end mechanical handle

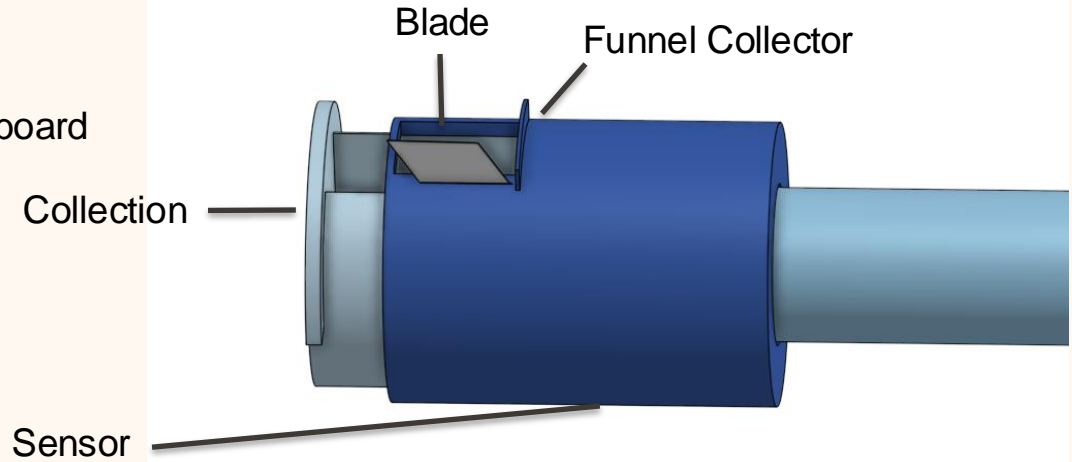
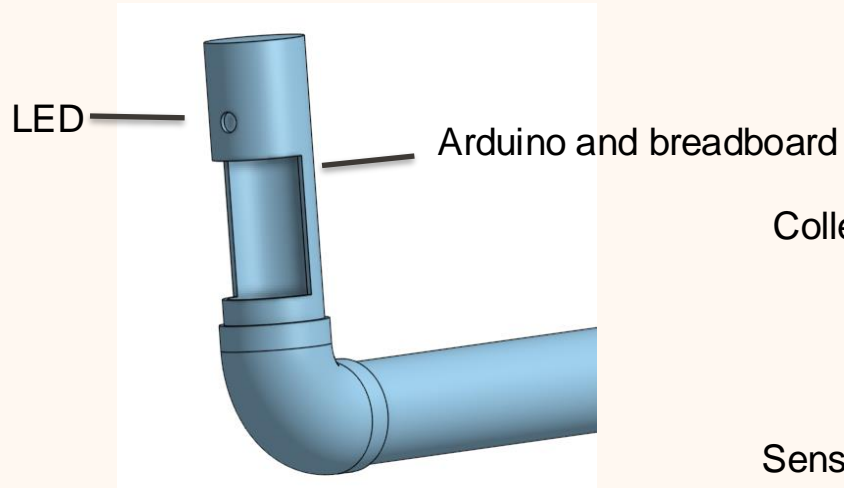
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Chosen Concept and Justification (Benjamin)

- Simple Manual Rotation
- Easily Adjustable Size
- Easily Removable Storage
- Simple Collection



Concept



Design and Development Process (Sana) (includes Research done)

Research

- Studied existing scraping tools and metal sampling techniques.
- Analyzed material properties and tool alignment needs.
- Currently researching Arduino and feedback integration.

Design and Assembly

Mechanical Design:

- Snap blades secured at scraping end
- Wheels for smooth motion
- Magnetic tape for holding container

Electrical Design:

- Arduino connected to touch sensor



Challenges and mistakes (Chaouki)



Financial constraints

- Limited to a 100\$ budget
- Design complexity had to be reduced to stay within budget
- Higher end components and construction techniques were severely limited



Coordination challenges

- Difficult to have consistent meeting due to scheduling conflicts
- Forced prioritization of certain tasks which limited the development of others
- Fast paced nature of the project made it difficult to assert consistent schedule

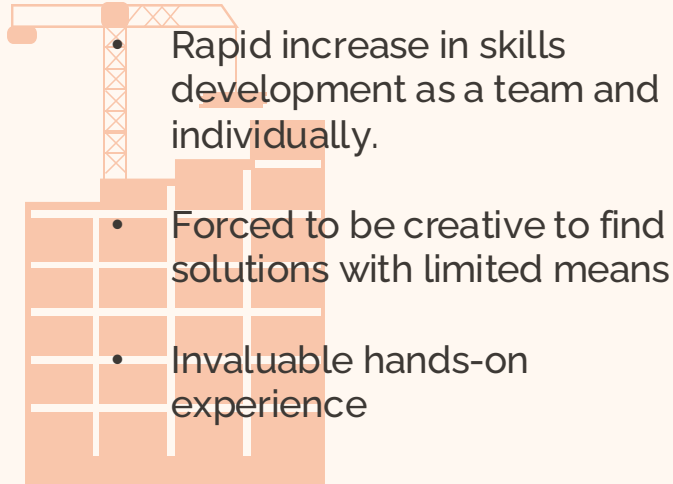


Lack of knowledge

- All experiencing manufacturing a product from ground zero.
- Learned difficult skills for the first time at a rapid pace

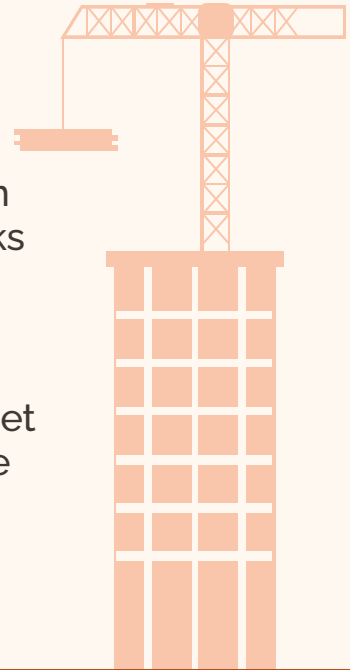
Lessons Learned and Final Thoughts (Chaouki)

Growth



Next Steps

- Refine the final design and make sure it works as intended
- Refine team communication and get everyone on the same page for the pitch
- Practice, Practice, Practice



Questions?

