



EID101E

Diabetes Testing and Education in Kampala

Professor Anita Raja



What is Diabetes?

- Affects body's natural ability to manage insulin
- High blood glucose
- Type 2 diabetes focus



Problem Statement

In Kampala, Uganda, there is no affordable and effective way to measure blood glucose levels for diabetics and very little widespread education about diabetes.

Design Considerations





Target:
Kampala,
Uganda

Background



4.2% ~60,000

Diabetic Prevalence

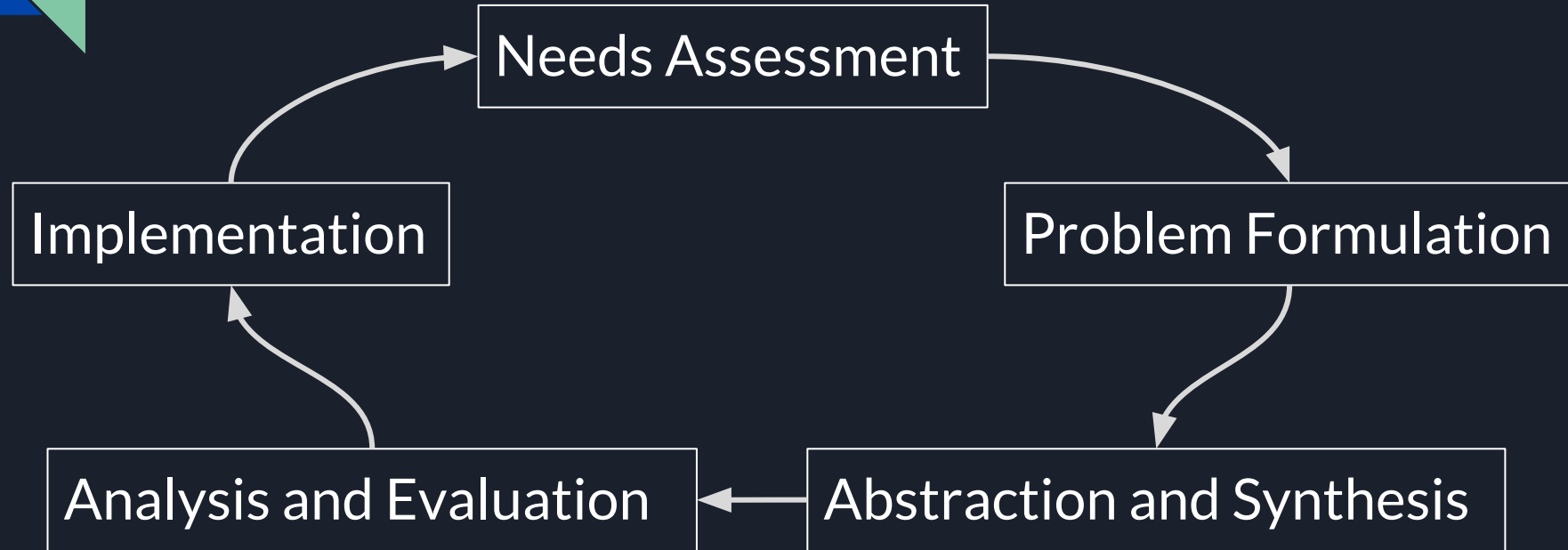


\$287.62

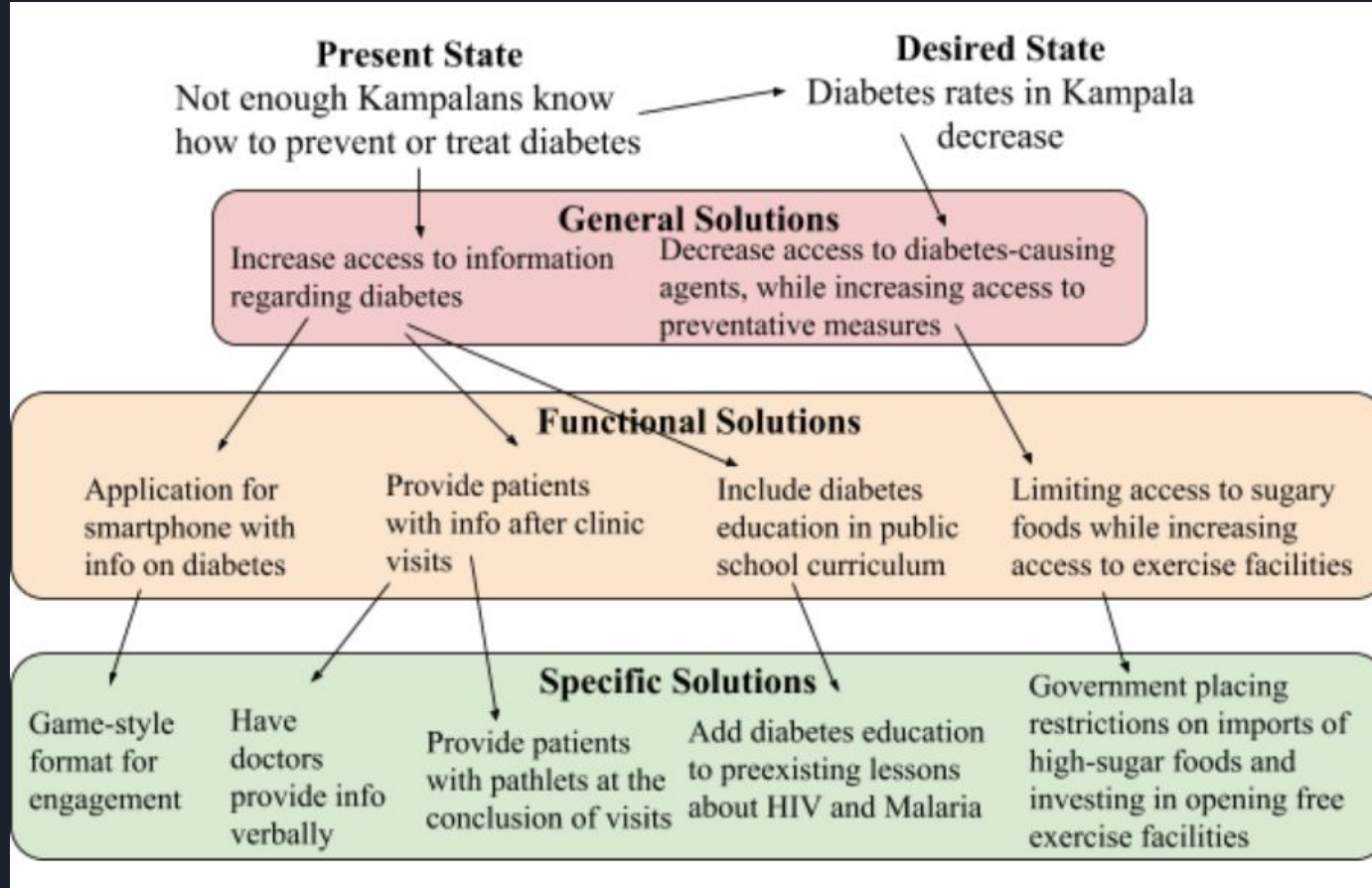
Average Monthly Household Income

Engineering Design Process

Abstraction / Synthesis

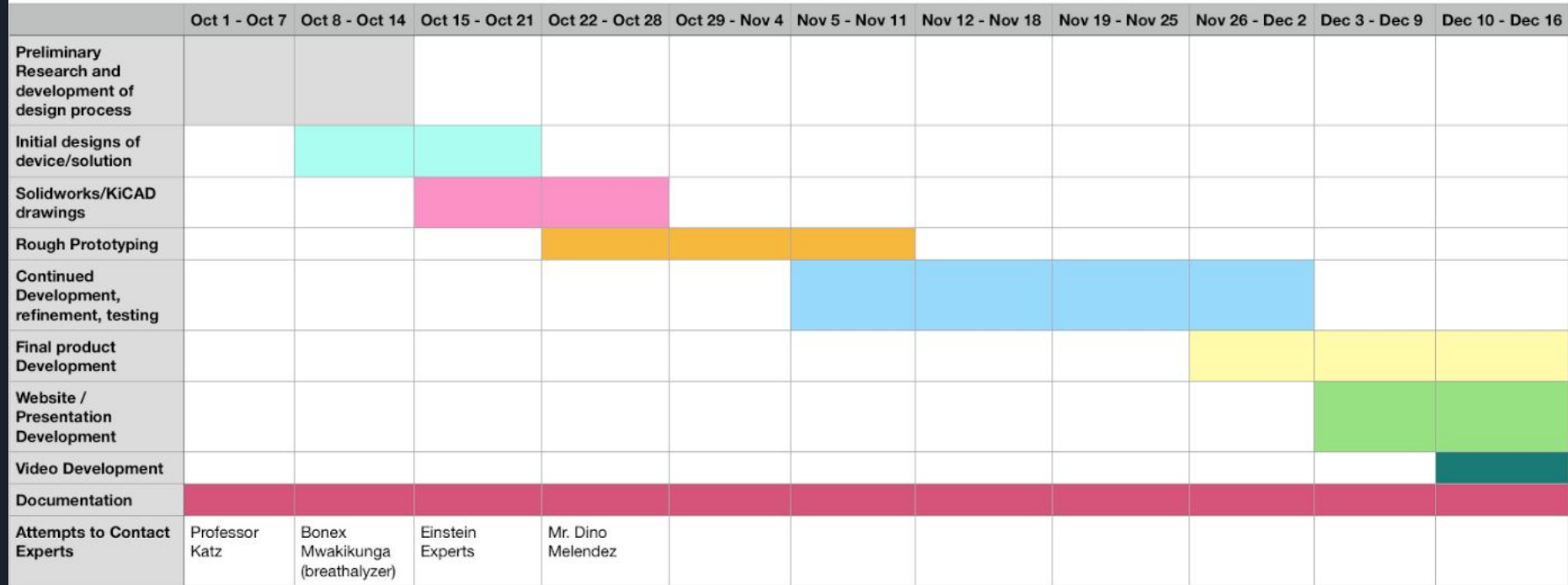


Duncker Diagram



Continued Development: Task 1

Gantt Chart of Task 1, Group 2



Task 1: Blood Glucose Testing

Group 1

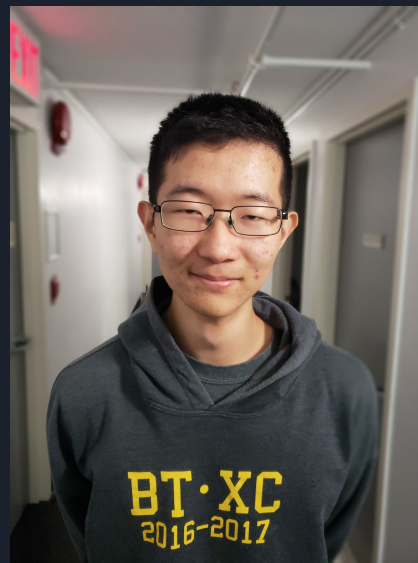
Group 2



Jon L.



Emily Y.



Joshua Y.



Radi F.

Task 2: Diabetes Education

Group 1

Group 2



Harper C-B.



Pia R.



Brandon H.



Derek L.

Task 1

Low-cost, sustainable glucose management device for people in Kampala

\$0.40+ per
test strip*



* <http://www.diabetesforecast.org/2012/jul/the-cost-of-test-strips.html>

Task 1, Group 1

Colorimetric paper strips with solution

Glucose oxidase + indicator

Easily detect changes in color

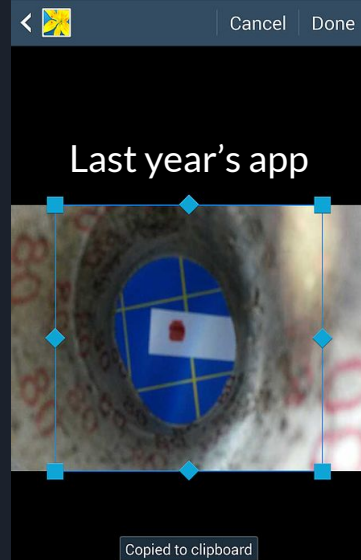


Methodology

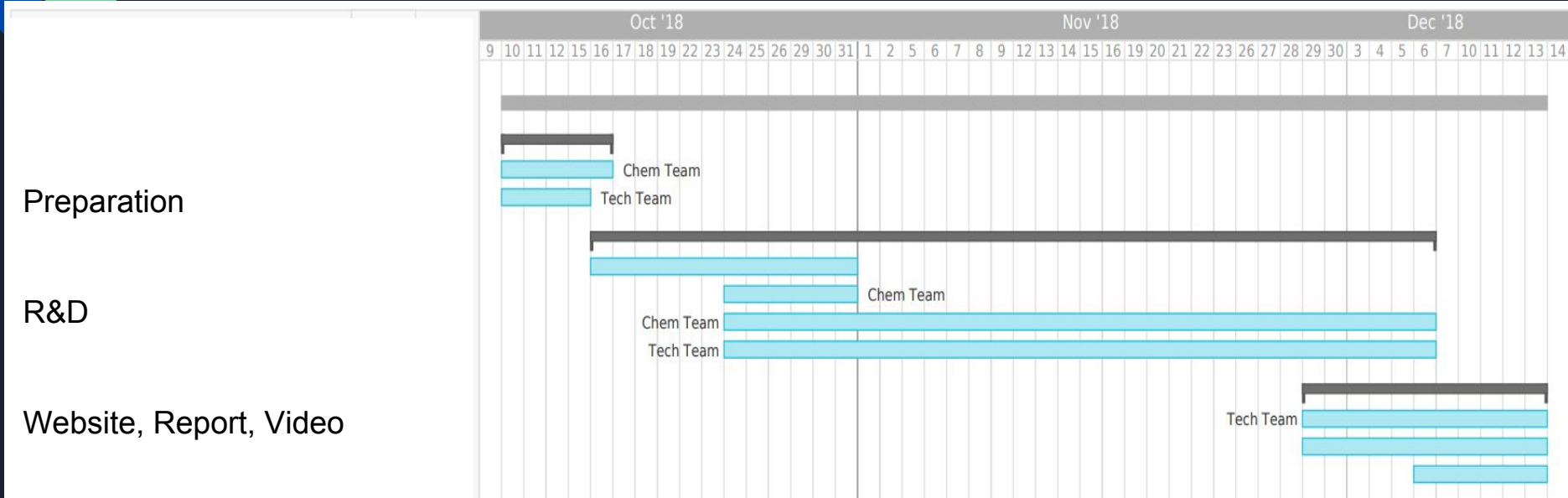
Testing different reagents for glucose

Testing different indicators

Testing color analysis algorithms



Progression & Cost Analysis



Item	Cost for Consumer
Chemicals/Materials	< \$0.01 / strip
Software and Information Distribution	\$0



Task 1, Group 2

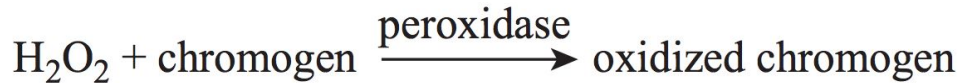
- Non invasive urine and breathalyzer testing.
- Communal approach to diabetes management.

Urine testing Cost analysis: ~ \$0.01

Reaction A:

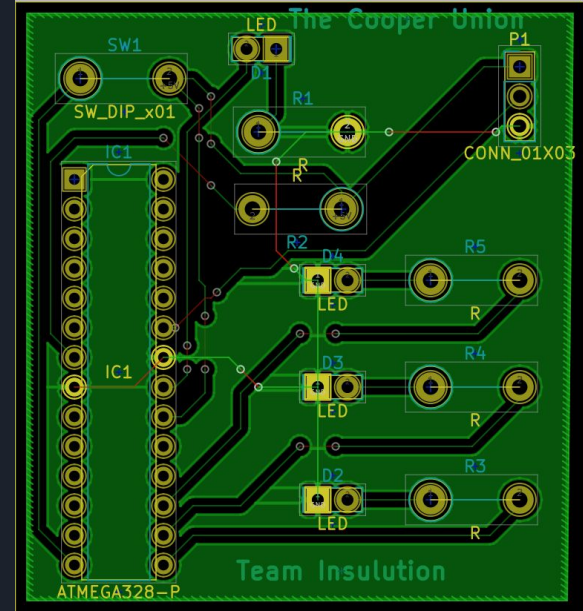


Reaction B:

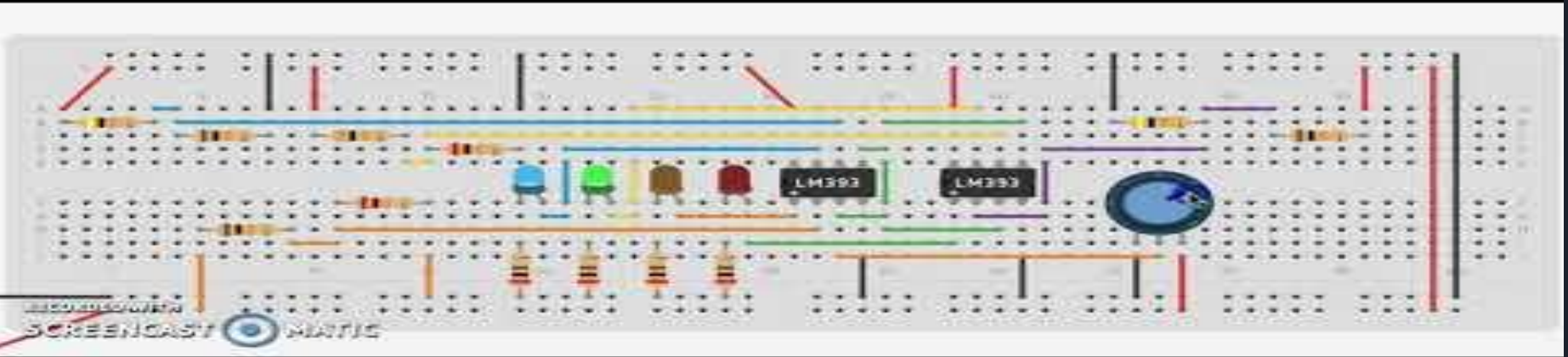


GLUCOSE 30 seconds	NEG	g/dL(%) mg/dL	1/10 100 Trace	1/4 250 1+	1/2 500 2+	1 1000 3+	≥ 2 ≥ 2000 4+
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Acetone Breathalyzer



Parts List:

Solar panel: ~\$5, ~\$3 for electronics, ~\$10 housing

Task 2

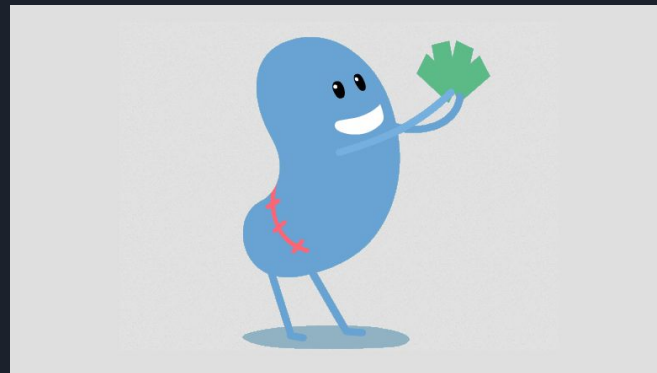
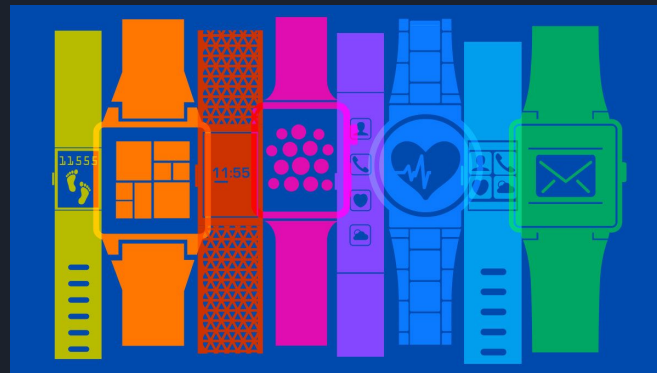
Self-care technologies and preventative education



Task 2, Group 1

Solutions:

- Wearable tech
- Educational app



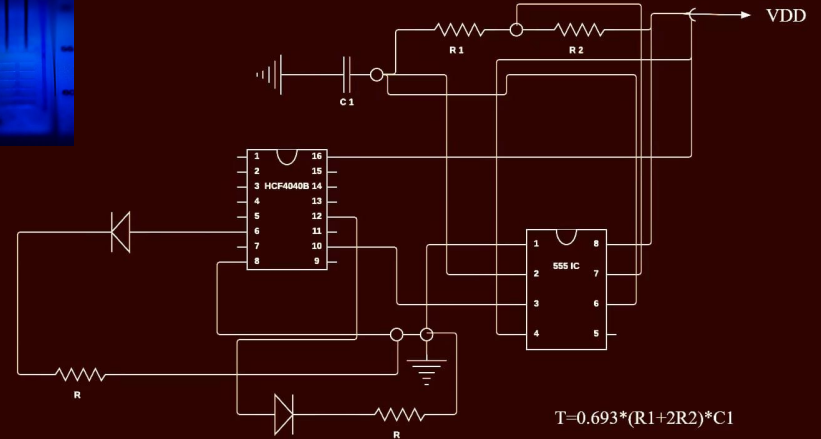
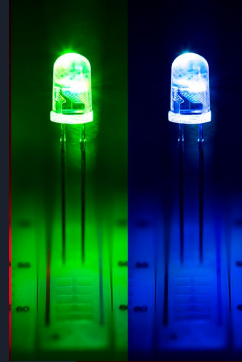
Wearable Tech

Analysis/Methodology

The Tech

555 timer,
potentiometer, and
counter

Solar powered



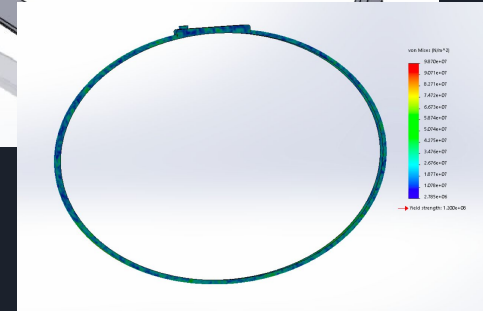
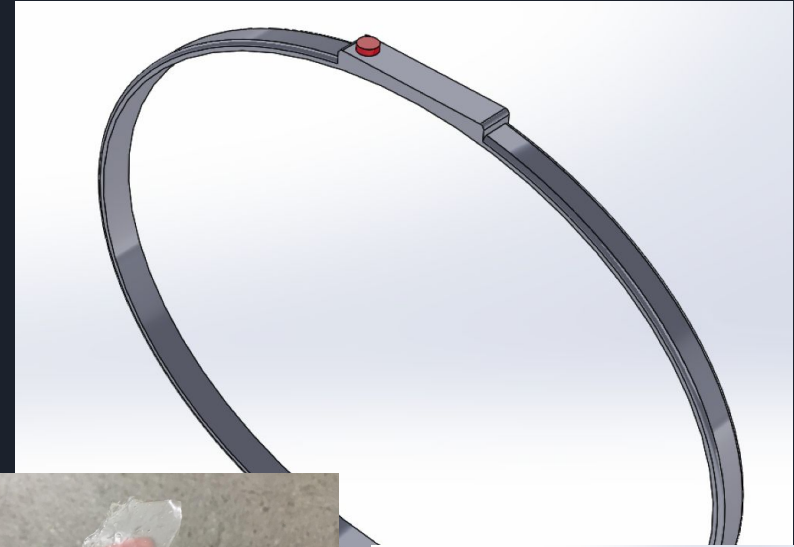
Wearable Tech

Analysis/Methodology

The Wristband

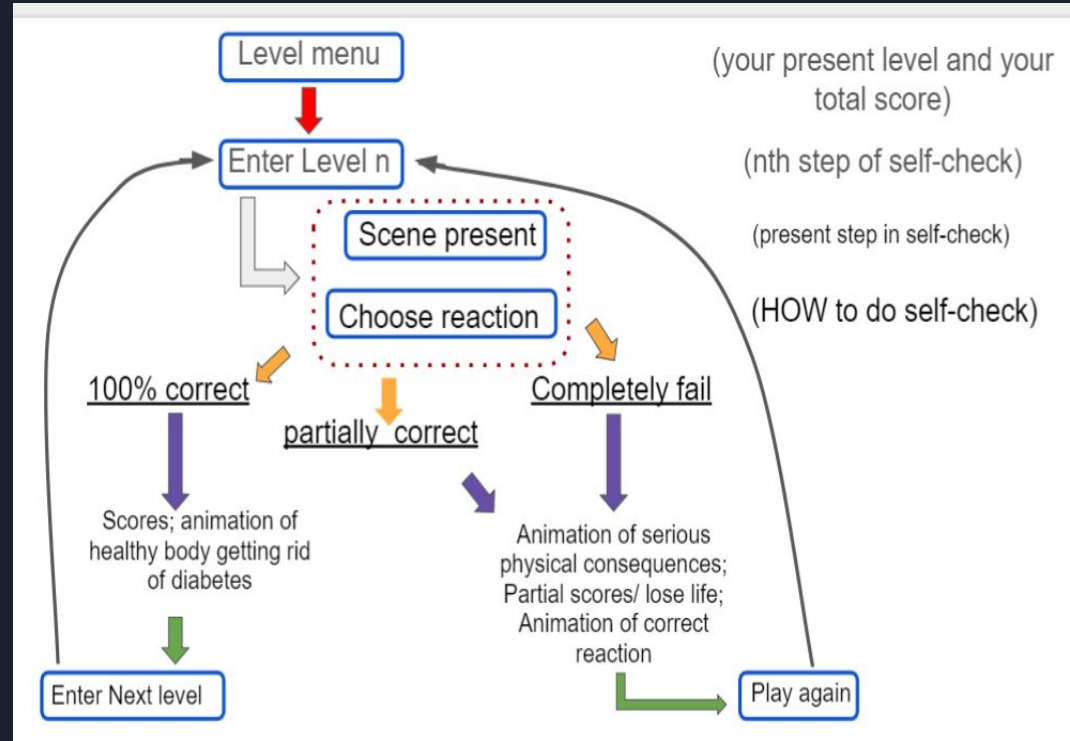
Locally, reproducible
bioplastic

Cost analysis: ~\$10



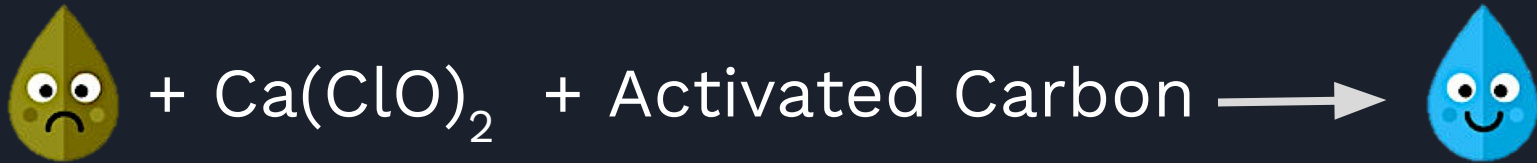
App

- General
- Treatment standards
- Exercise
- Diet



Task 2, Group 2

Water Purification and Diabetes Education



25% or 350,000+

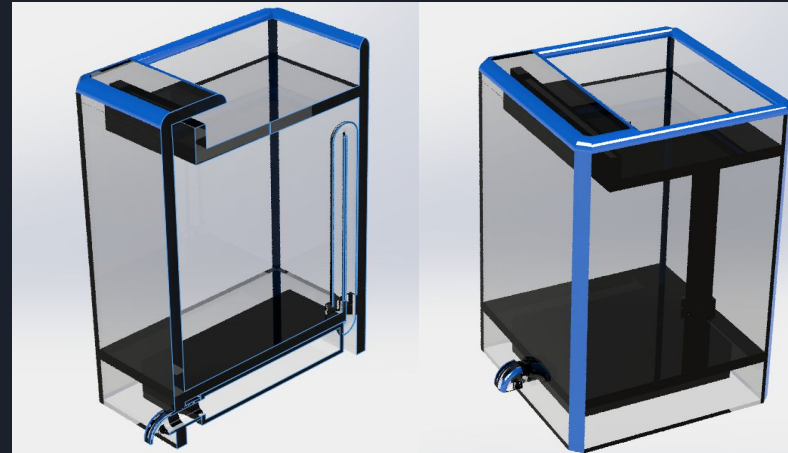
No access to clean water

Purification Methodology

Testing the amount of charcoal
and chlorine needed

Create a siphoning method

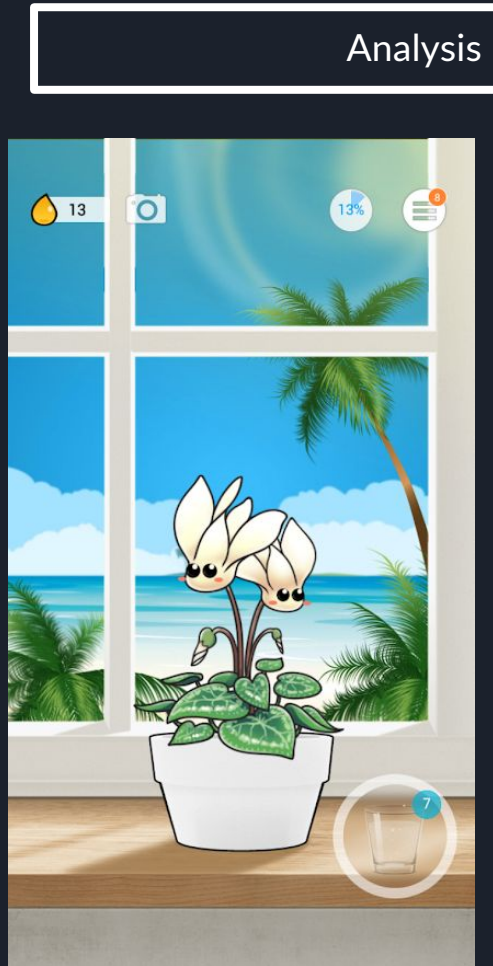
Cost: ~\$15-20



App Methodology

Creating a compatible sensor on filter

Program app





Acknowledgements

Professor Raja

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Thank You!

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