GLUCOSE MONITORING DEVICE

Peter Baccarella, Amy Leong, Catherine Chen, Vincent Wang, Jonathan Lam, Emily Yasharpour

Objective / Background

Colorimetric test strips for diabetics in Kampala within constraints of cost, manufacturability, and user-friendliness

Background

4.2% or 63,297

Diabetic Prevalence and Diagnosed Diabetic Population

$287.62

Average Household Income

Methodology/Solution

- Colorimetric test strips with emphasis on:
  - Different Enzymes & Indicators
  - Improved Image Processing
  - RBC Separation

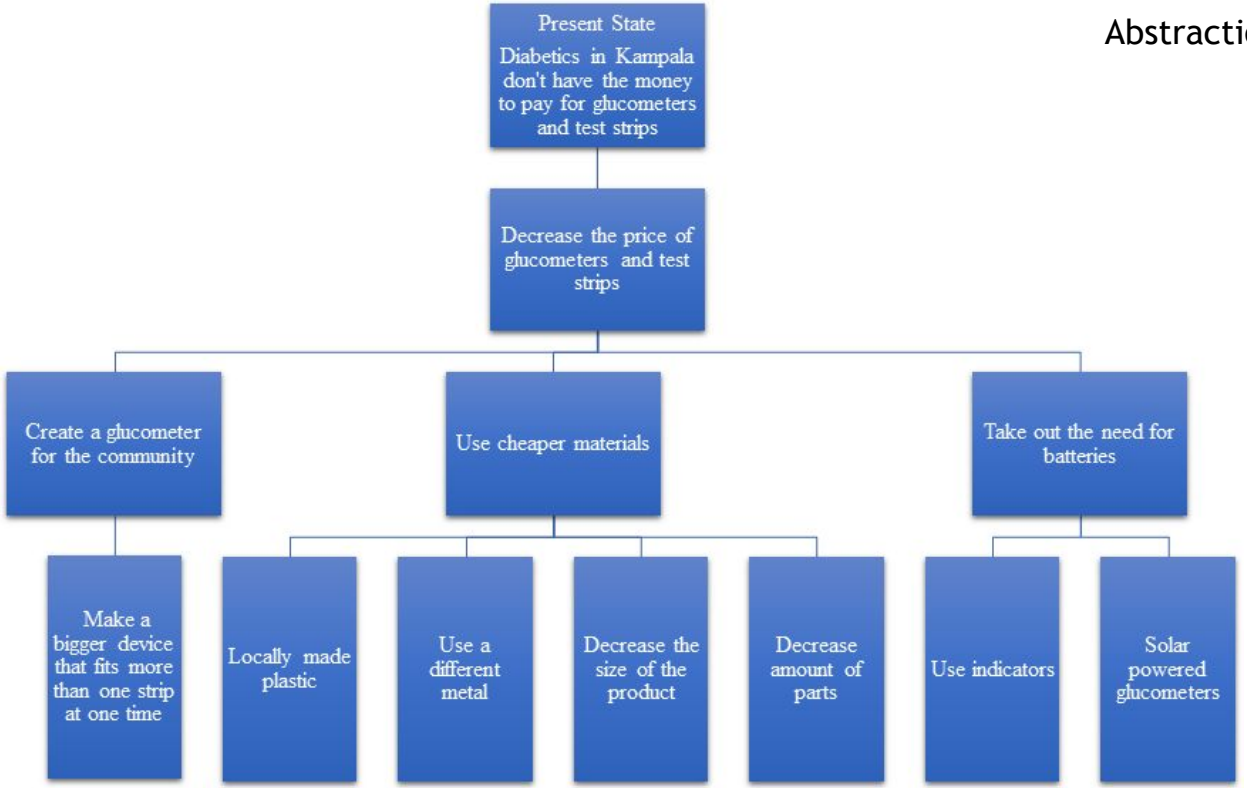

Figure 1A: Duncker Diagram (Present State)

Abstraction & Synthesis

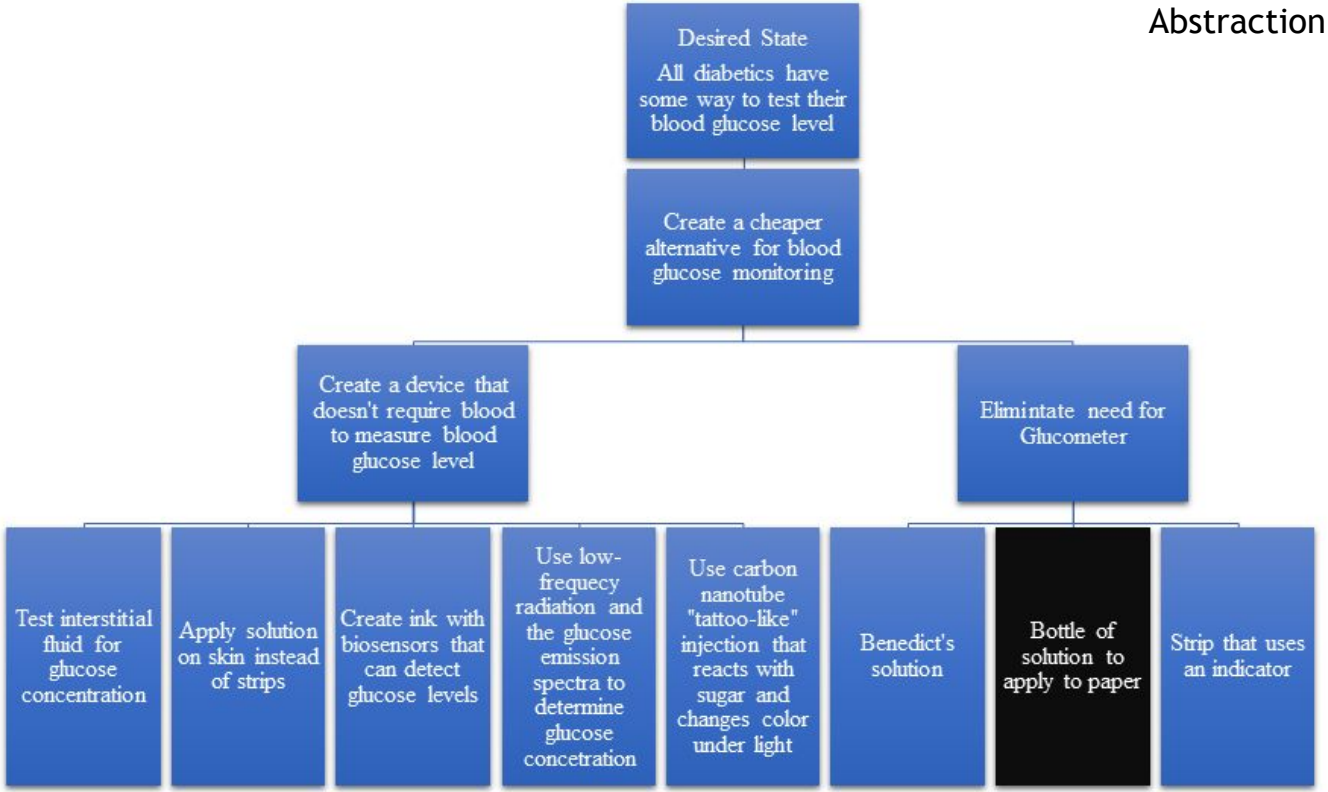

Figure 1B: Duncker Diagram (Desired State)

Proposed Design

Indicators:

- Iodine-starch (control), Redox, Acid/base

Primary chemical reaction:

- Glucose oxidase, Benedict's and Fehling's solution, Yeast

Software:

- Control (eliminate RBC color and lighting)
- Statistical analyses

Proposed Design

Other improvements:

- Glass Fiber Mesh
- Different Papers

Models:

- Glucose solutions
- Marker and paper optical calibration

Occam's Razor

- Reject Glucometer for Test Strips
- Reject Centrifuge for Glass Fiber Mesh

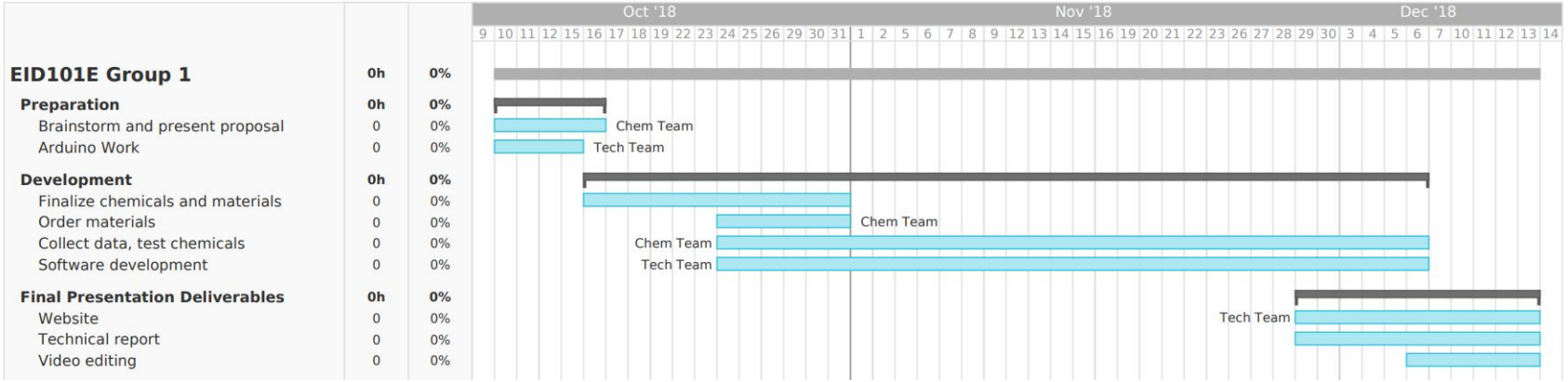

Figure 2.2A: GANTT Chart

Role	People
Leaders / Primary spokespeople	Vincent, Emily, Peter
Note-taking	Amy
Designing, modeling, prototyping (chemicals)	Catherine, Emily, Peter, Vincent
Designing, modeling, prototyping (data analysis and software)	Amy, Jon
Webmaster	Jon, Peter
Technical Report	Jon, Vincent, Catherine, Amy

Figure 2.2B: Primary Responsibility Chart

Challenges

- Finding a non-toxic, low-cost, locally sustainable alternative chemical indicator
- Accurately and reliably analyzing the color to determine blood glucose concentration

References

Ofek, Yuval et al. “The Colorimetric Test Strip.” *G Cubed Solutions*, Wix.com, 2017, https://minhtyyufa.wixsite.com/gcubedsolutions/the-strip. Accessed 1 Oct 2018.

Gebel, Erika. “Anatomy of a Test Strip.” Diabetes Forecast, July 2012, www.diabetesforecast.org/2012/jul/anatomy-of-a-test-strip.html. Accessed 1 Oct. 2018.

“Glucometer Test Kit.” How Products Are Made, www.madehow.com/Volume-7/GlucometerTest-Kit.html. Accessed 1 Oct. 2018.

Jensen, Sarah. “How Do Glucometers Work?” Mit Engineering, 18 Oct. 2011, engineering.mit.edu/engage/ask-an-engineer/how-do-glucometers-work/. Accessed 1 Oct. 2018.

Katz, Laurence B., Mike Grady, Steven J. Setford, and Brian L. Levy. "OneTouch Blood Glucose Monitoring Systems - Impact of New Technologies on the Efficacy of Self-monitoring Blood Glucose." (n.d.): n. pag. Print.