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# Empowering Students in Math through Entrepreneurship

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**#NCTM100**  
**@EEkrupa**



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# Project Staff, Partners, and Support

## Project Staff

**Jere Confrey**, Co-Principal Investigator

**Erin Krupa**, Co-Principal Investigator

**Mike Belcher**, Research Associate

**Josh Mannix**, Graduate Research Assistant

We gratefully acknowledge support from:



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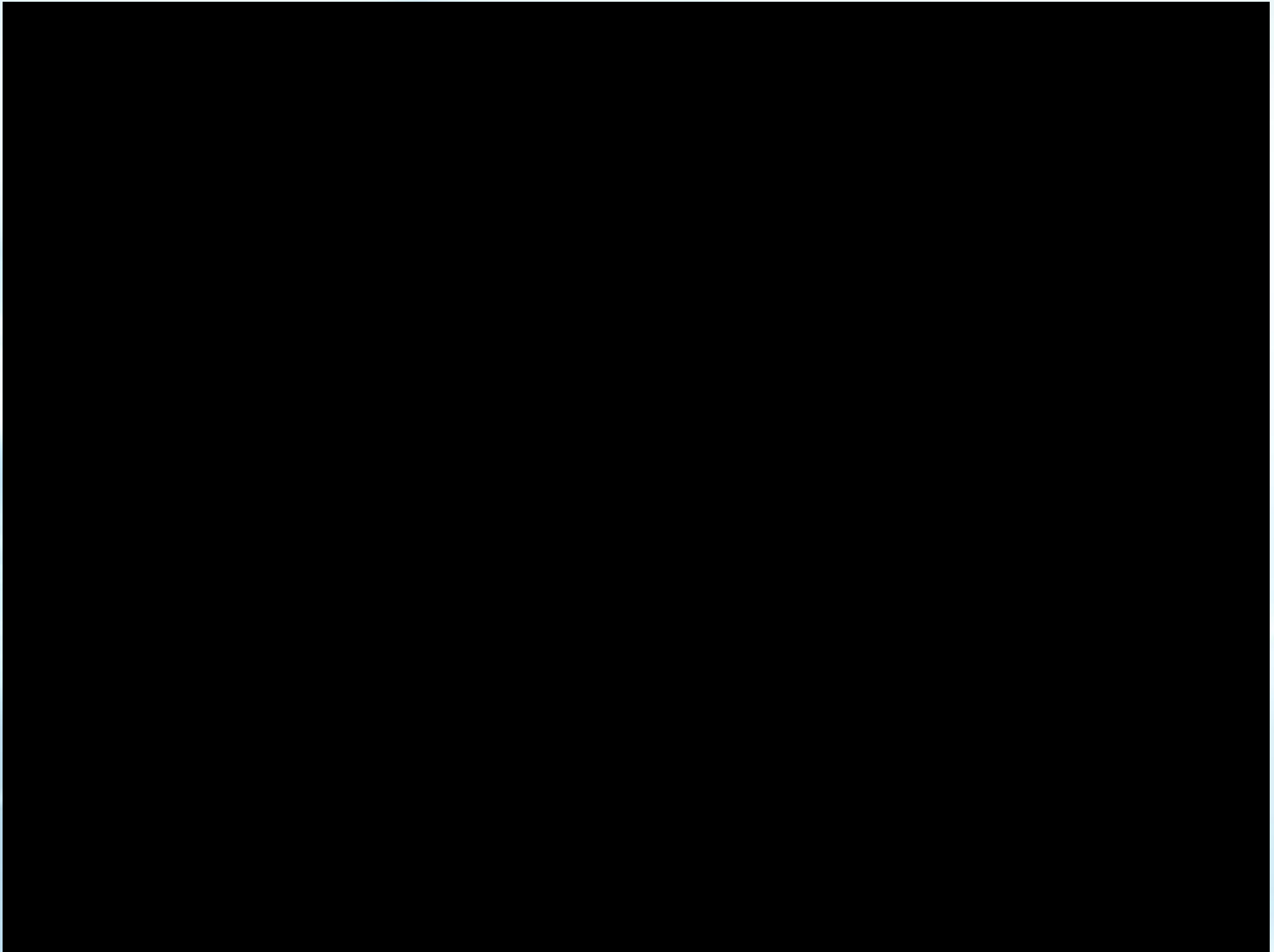
Materials for Design and Pitch  
Challenges have been authored by the  
SUDDS team and produced by Jason  
Learning



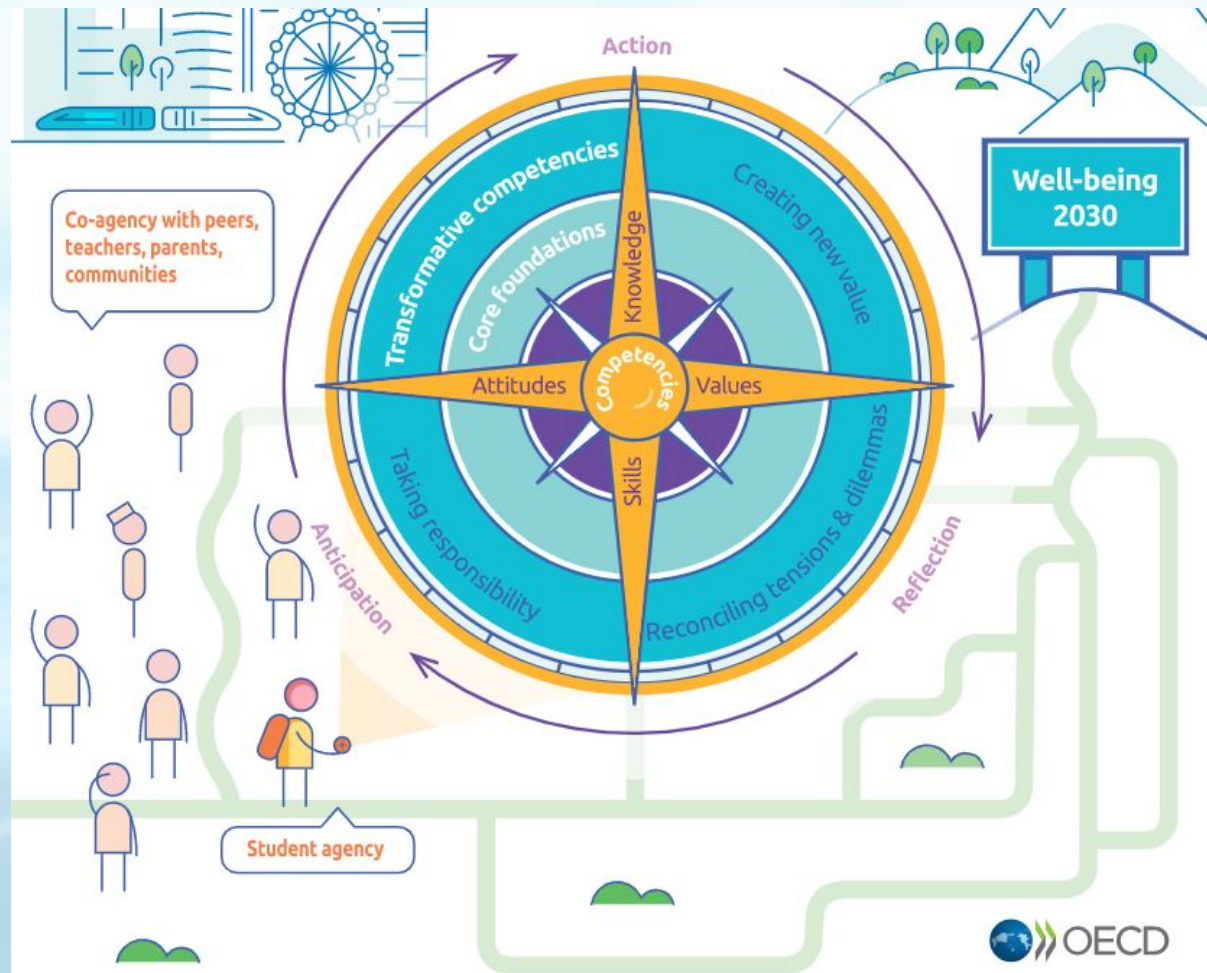


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# Jere's Video



# OECD 2030 Framework





# Goals of the Project

Use entrepreneurship and pitch competitions to get students excited about and engaged in STEM.

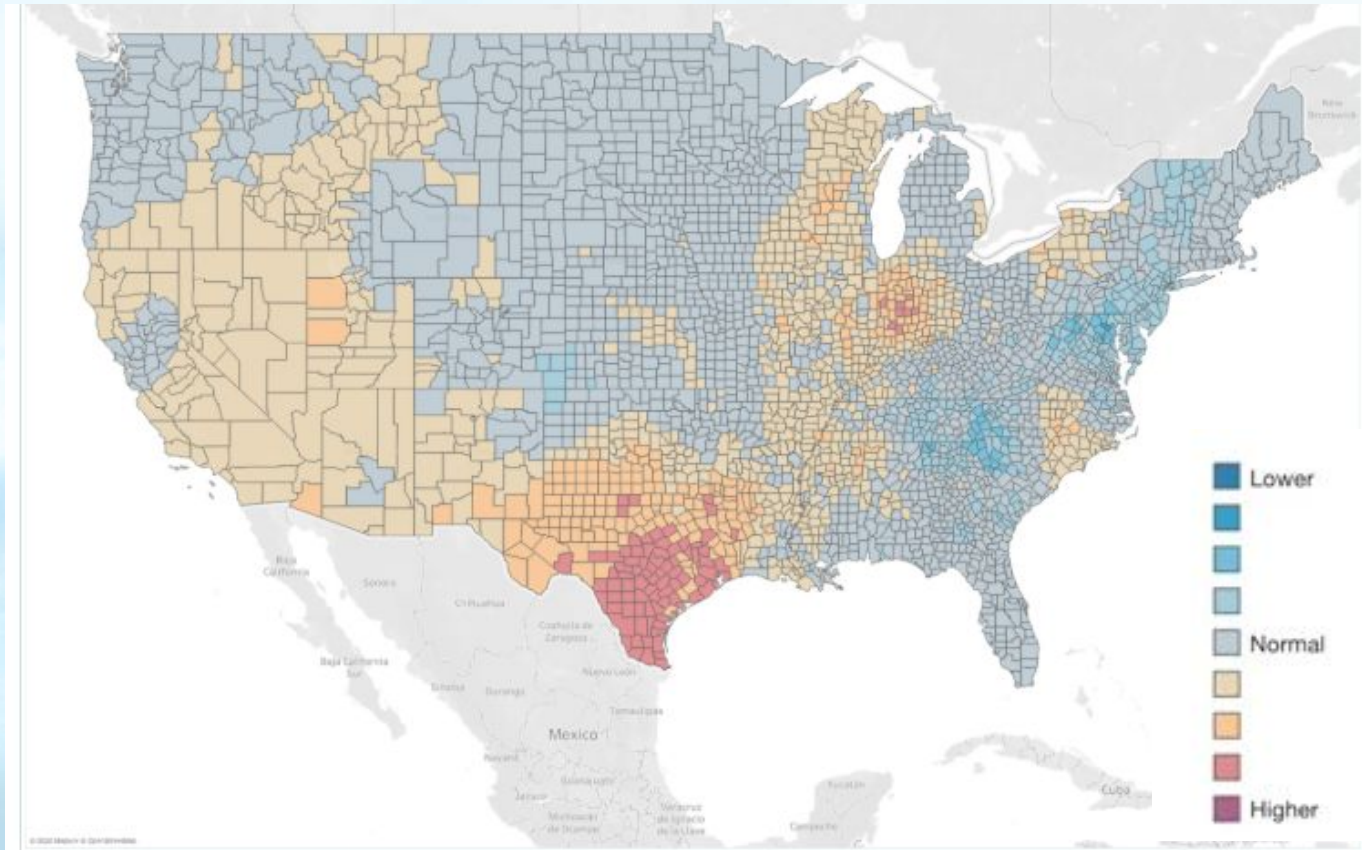
Developed challenges that:

- Are open enough to allow students to innovate using their out-of-school expertise
- Include criteria that make math central to students' innovations
- Motivate the learning of new STEM content, especially math





# Solving Problems in Real-Time



June 17 – We see higher than expected levels of illness transmission in several areas which we now see are experiencing a large surge in COVID-19 cases, including Texas, South Carolina, Arizona, Southern California.



# Why Entrepreneurship?

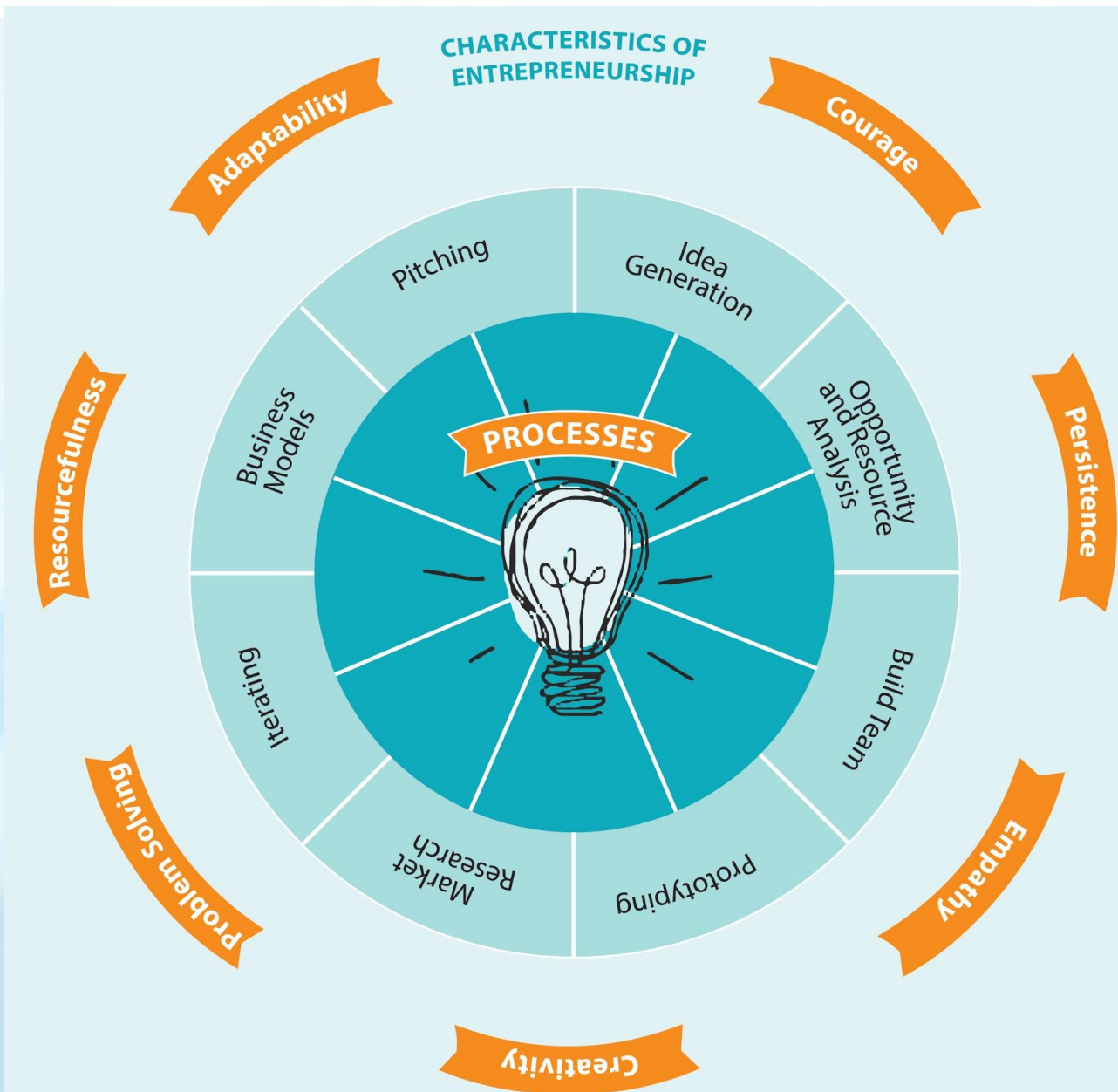


- Seeking Out Diversity
- Finding Opportunities
- Identifying Resources
- Defining and Solving Problems
- Acting on Solutions
- Making the Economy Work for You

# Entrepreneurial Framework

The D&P Challenges are designed to:

- (1) Elicit entrepreneurial characteristics
- (2) Engage students in entrepreneurial processes







# Challenges, Champions, and Mentors

## Challenge Champions

### Operation Lifeline



**Kris Ludwig**  
Scientist  
United States  
Geological Survey

### Power Me Up



**Kristin Vicari**  
Senior Chemical Engineer  
Tesla

### Keep It Real



**Cardell Patillo**  
Executive Director  
Mile High Kids

### Building Algorithms



**Cathy Yee**  
CEO & Founder  
Incluvie

### Prototype to Profit



**Tyler Maloney**  
Materials Science Engineer  
& Entrepreneur

### Erase Food Waste



**Oscar Ekponimo**  
Founder & CEO  
Chowberry

### Fix It: Design for Community Impact



**Gitanjali Rao**  
Inventor & STEM  
Promoter

### Flashy Fashion



**Kelsy Dominick**  
Designer & CEO of  
DiDomenico Design

### Pollution Solution

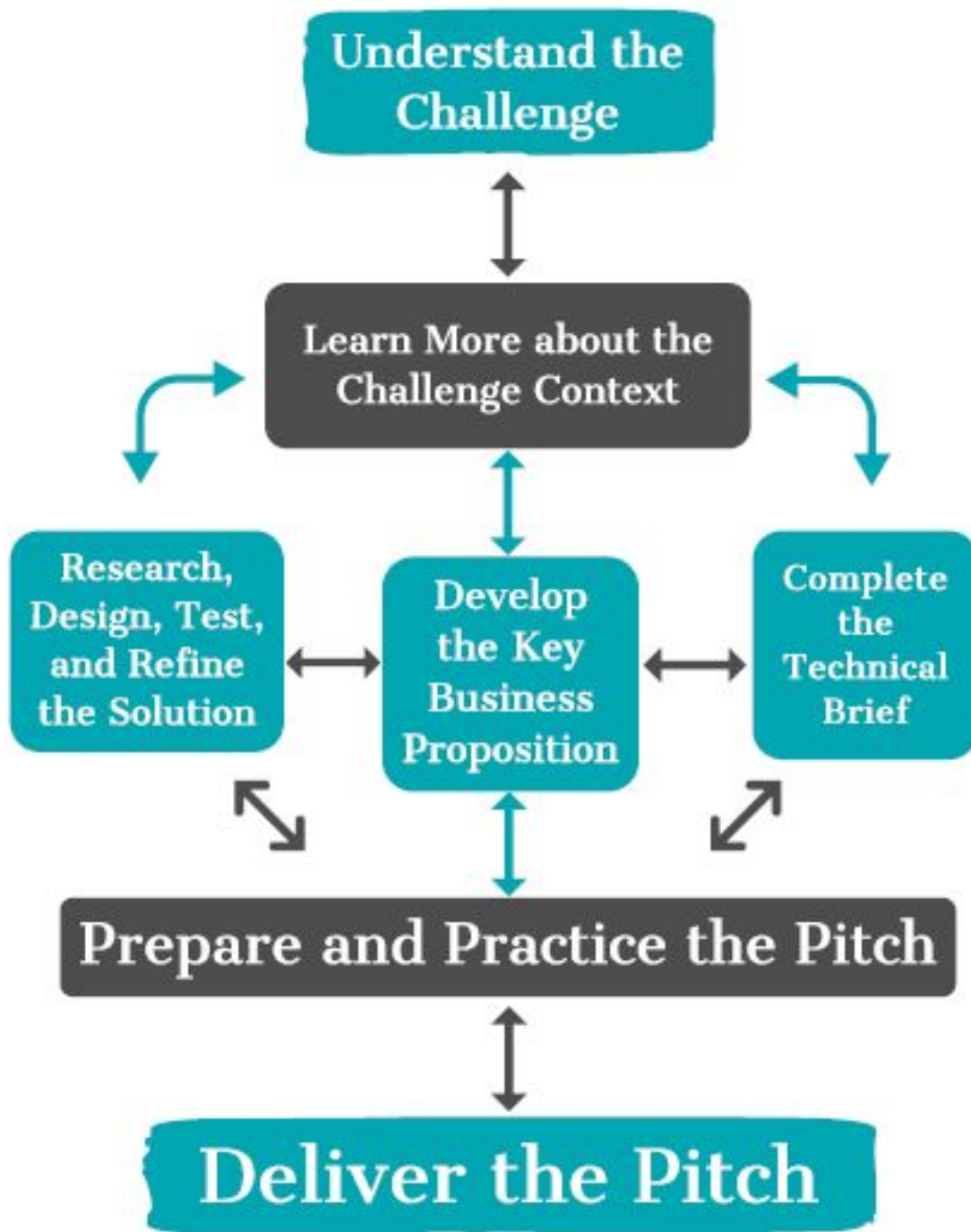


**Clifford Okoth Owino**  
Founder & CEO of  
Chemolex

## Entrepreneurial Mentors



# Challenge Process





# Keep it Real



**Problem:** phubbing

**Challenge Champion:**  
Cardell Patillo,  
Executive Director Mile  
High Kids

**Target Math:** building  
and coordinating data  
representations

Visit <https://sites.ced.ncsu.edu/design-and-pitch/challenges/keep-it-real/> to see the full set of materials for Keep it Real



# Keep it Real: Targeted Math

Displaying Univariate Data

Analyze data and present a convincing argument with statistics

Build a representation to represent collected data.

## Summarize and describe distributions.

CCSS.MATH.CONTENT.6.SP.B.4

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

CCSS.MATH.CONTENT.6.SP.B.5

Summarize numerical data sets in relation to their context, such as by:

CCSS.MATH.CONTENT.6.SP.B.5.A

Reporting the number of observations.

CCSS.MATH.CONTENT.6.SP.B.5.B

Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.



# Understand the Challenge







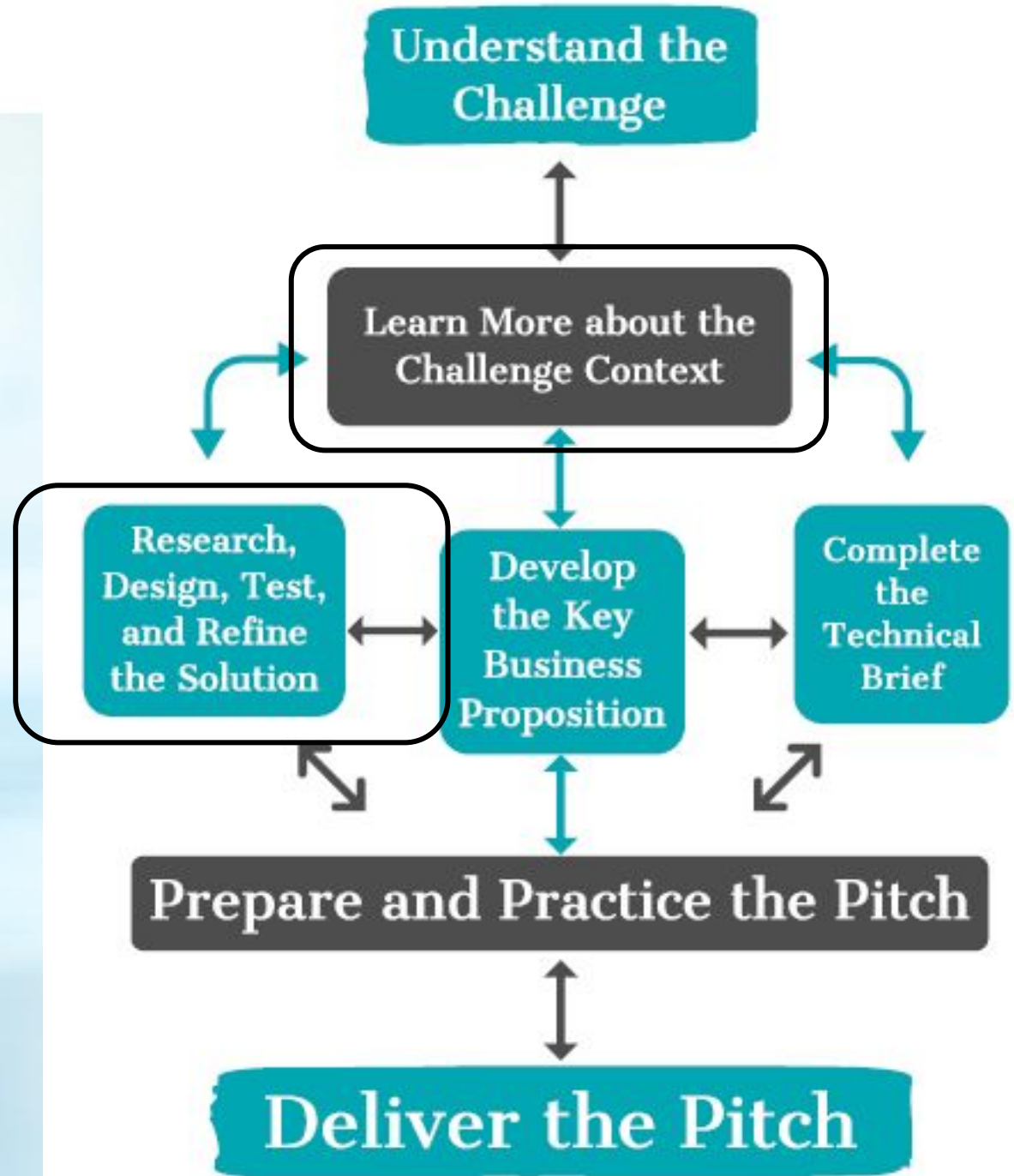
# Challenge Statement

Your challenge is to design an app that uses a data representation to help people manage their phubbing. Your app should:

1. Be something customers will want to use.
2. Collect data on a user's phubbing behaviors (how will the app know when you're phubbing?).
3. Include an easy-to-interpret and useful representation of a user's phubbing data.
4. Allow users to set goals to reduce phubbing and monitor their progress towards those goals.



# Research and Prototype





# Challenge Resources

## The Dangers of Phubbing:

- › Watch this video to learn how phubbing can have negative effects on our relationships.  
[Phubbing is Hurting Your Relationships](#)
- › Use these resources to learn about smartphone addiction and “nomophobia,”; the fear of being unable to use your smartphone.  
[Smartphone Addiction Could Be Changing Your Brain](#)  
[Does Your Cell Phone Give You Anxiety?](#)
- › Use this resource to learn about the health effects of smartphone use.  
[16 Seriously Damaging Side Effects of Smartphone Use](#)

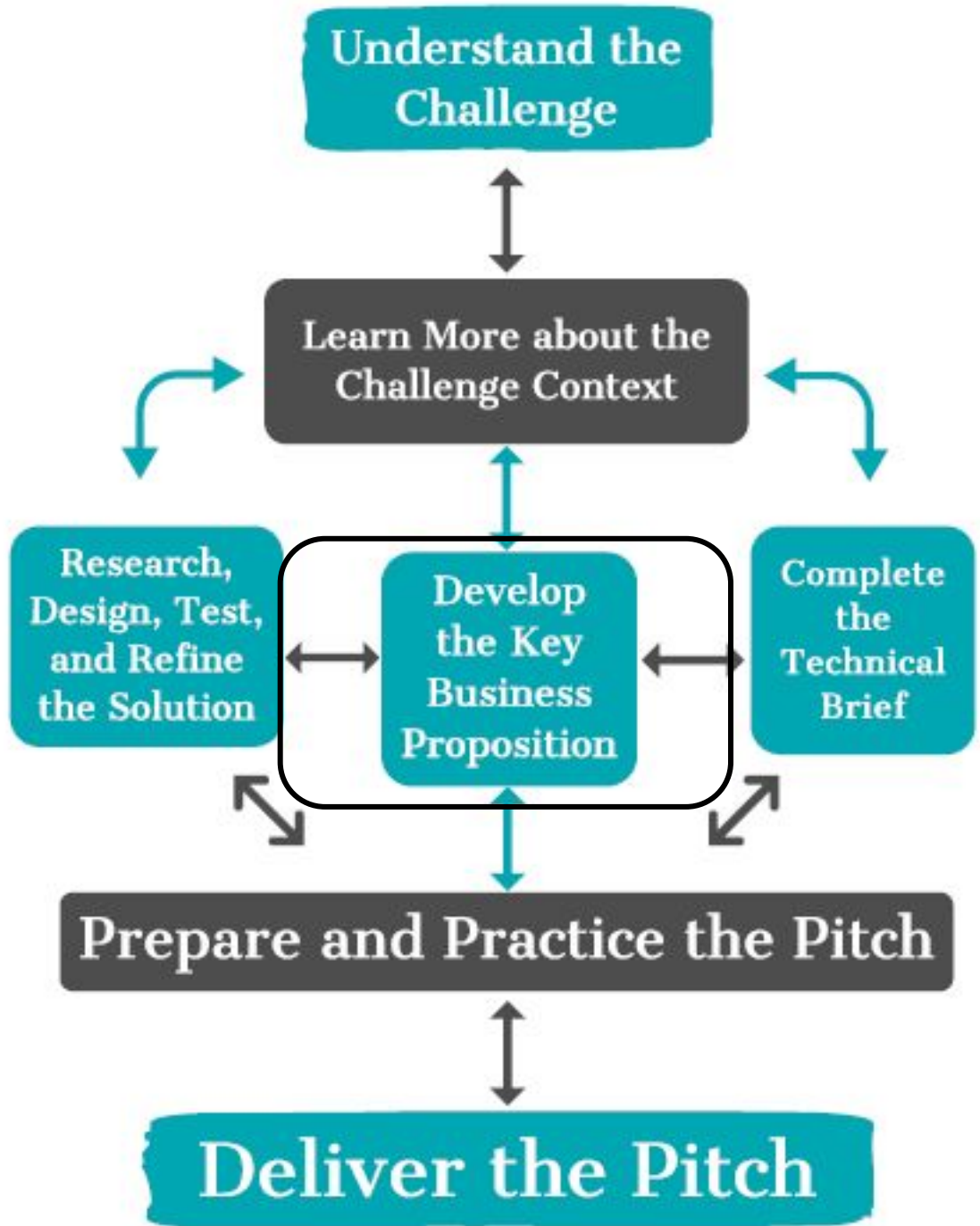
## Apps that Help People Manage Their Smartphone Use:

- › Use these resources to learn how other companies are trying to help users manage their smartphone use through data and feedback. As you explore these apps, think about what each data representation shows and hides about smartphone use.  
Apple Screen Time: [Screen Time Allowances and Limits](#)  
Flipd: [Flipd App Website](#)  
Glued: [Are You Addicted to Your Mobile Phone?](#)  
Moment: [Moment App Website](#)

## Building and Designing Your App:

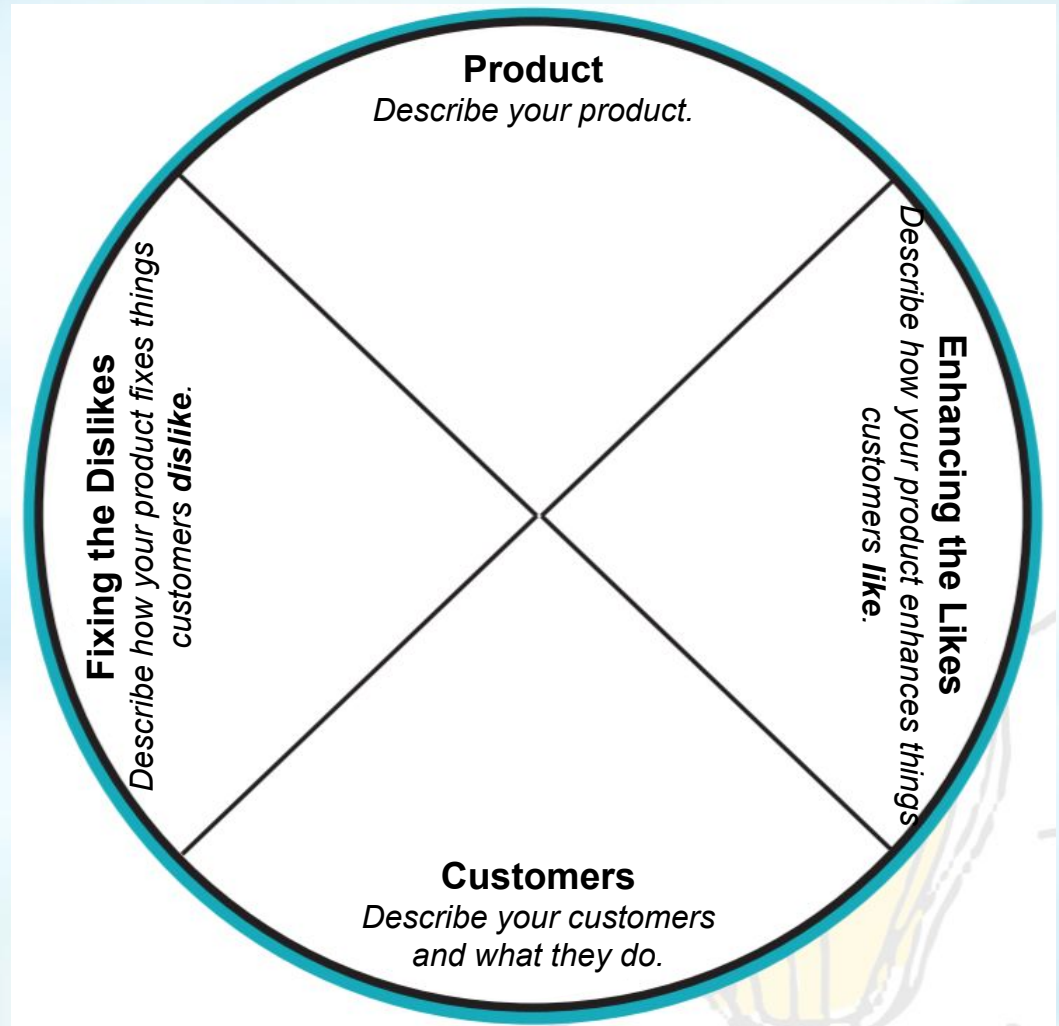
- › Use this resource to learn about the steps involved in building and designing an app.  
[How to Make an App](#)

# Making Solutions Actionable





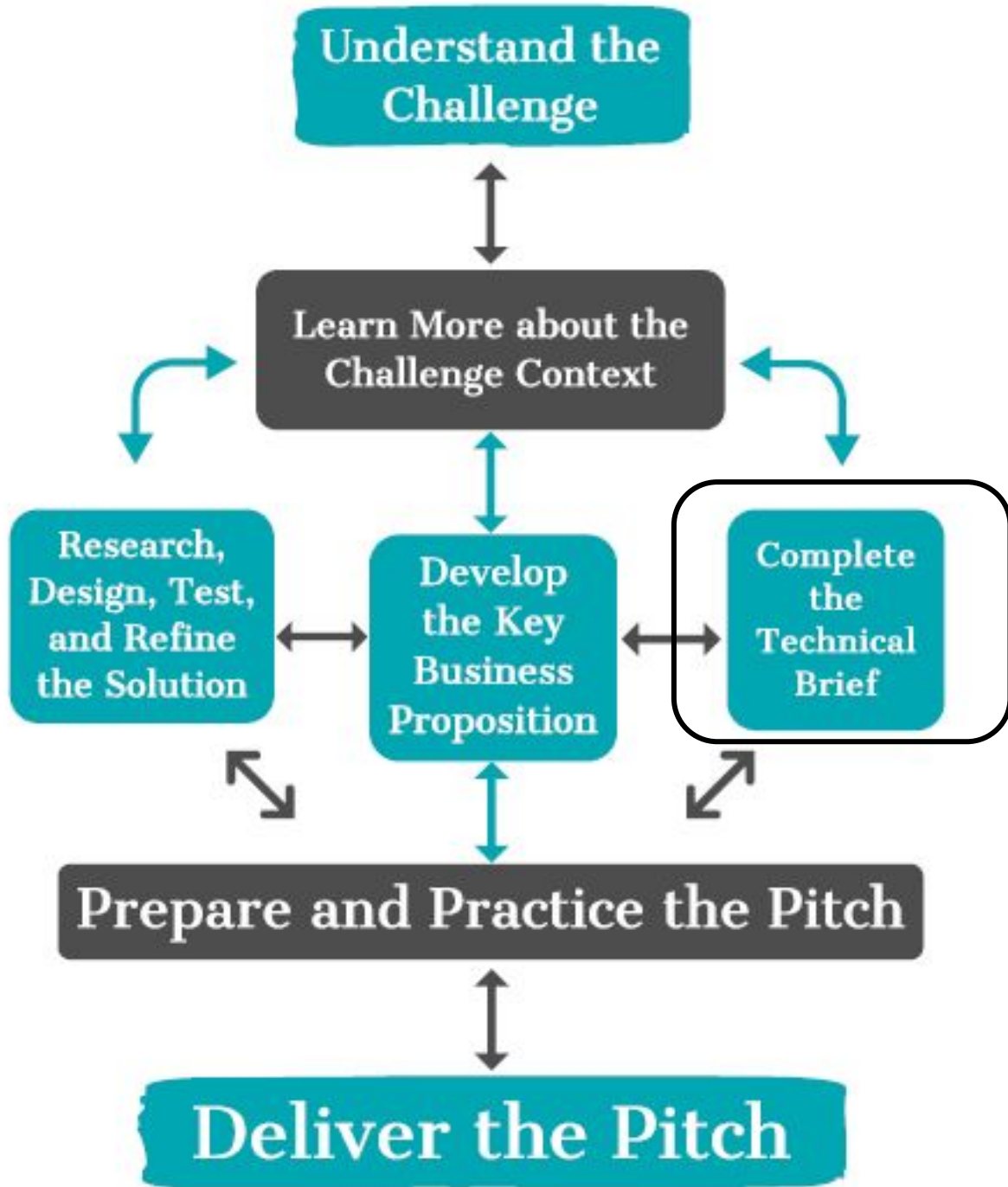
# Key Business Proposition and Business Model Types



Visit <https://sites.ced.ncsu.edu/design-and-pitch/challenges/keep-it-real/> to see the full set of materials for Keep it Real



# Describing Product Specs





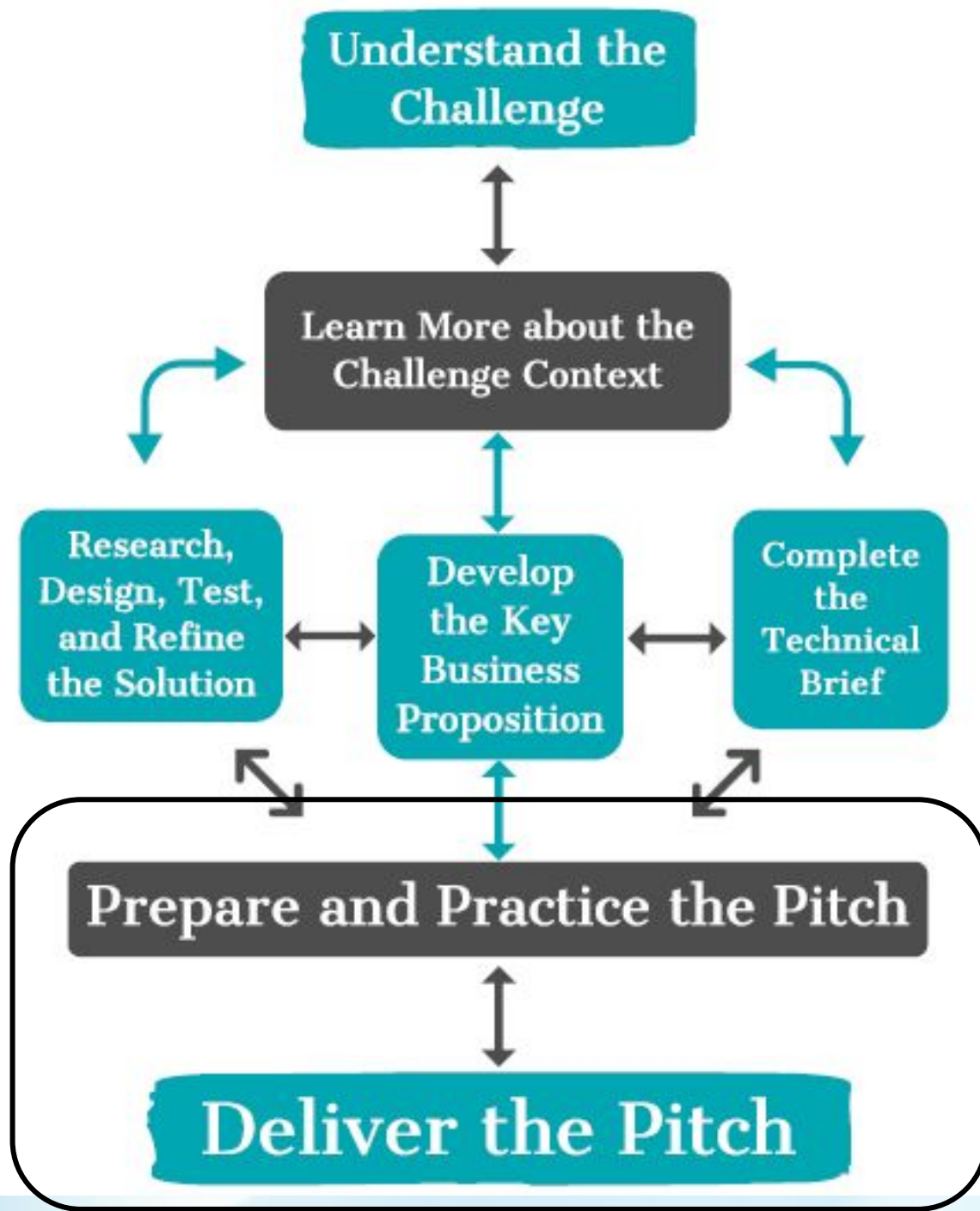
# Technical Brief

**PART 7. Fully describe your Keep It Real solution based on the questions below.**

- A. What does your app do?
  - a. Describe what your app does and how it helps users stop phubbing.
  - b. Describe your target customers and why they will want to use your app.
- B. How does your app collect data on a user's phubbing?
  - a. Describe the data your app will collect.
  - b. Explain what these data tell you about a user's phubbing and why you chose them.
  - c. Describe, in detail, how your app will collect these data.
- C. How does your app present data to users
  - a. Create a sample of data representation that will be presented to users.
  - b. Explain what this representation shows users about their phubbing.
  - c. Explain what this representation hides from users about their phubbing.
- D. How will your data representation help users learn to manage their phubbing?
  - a. Create a sample data representation for a user who is phubbing less over time.
  - b. Describe how your app and data representation will help users keep track of whether they are getting better at managing their phubbing.

Visit <https://sites.ced.ncsu.edu/design-and-pitch/challenges/keep-it-real/> to see the full set of materials for Keep it Real

# Convincing Investors





# Pitch Resources

What solution did you come up with for Erase Food Waste? Get help with your pitch here.

## Building Your Pitch

Use this resource to build an engaging, persuasive pitch.



### HOW TO BUILD YOUR PITCH

Use this sheet to judge how well you developed and delivered your solution for Erase Food Waste.

### PITCH JUDGING SHEET

Visit <https://sites.ced.ncsu.edu/design-and-pitch/challenges/keep-it-real/> to see the full set of materials for Keep it Real



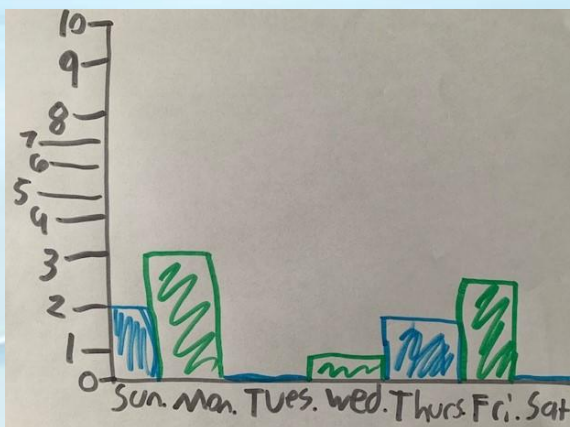


# Building Representations

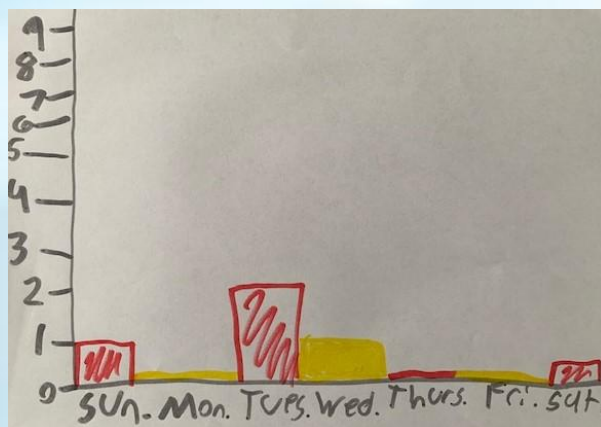
Students need opportunities to consider tradeoffs between representations and select the ones that work best for their purpose. Several teams chose relatively simple representations, but it was their choice and they were willing to defend it.

Sbubby represented the number of times per day a user unlocks their phone after it hears their name, using a simple bar graph. They created sample representations for three weeks to show what “improvement” might look like.

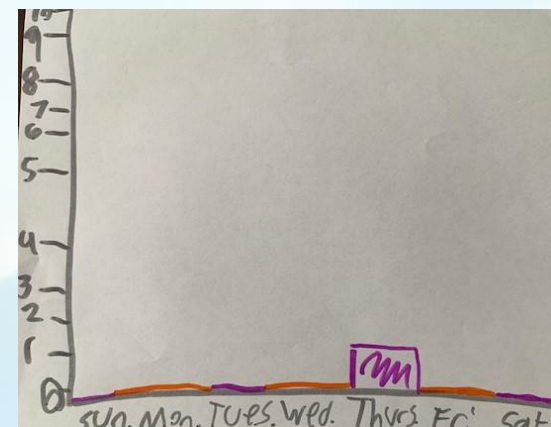
**Week 1**



**Week 2**



**Week 3**

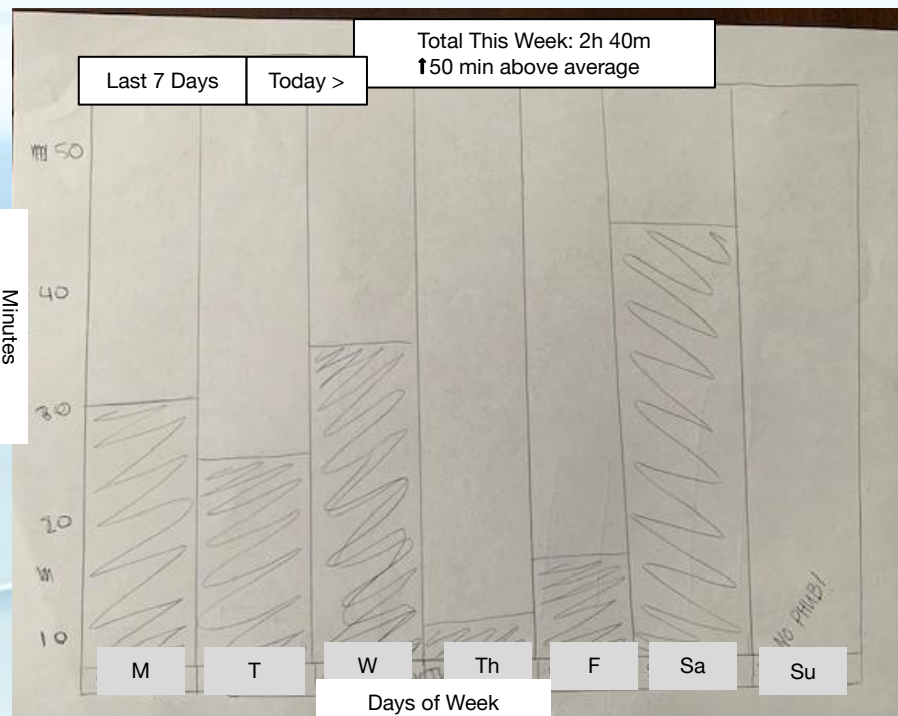




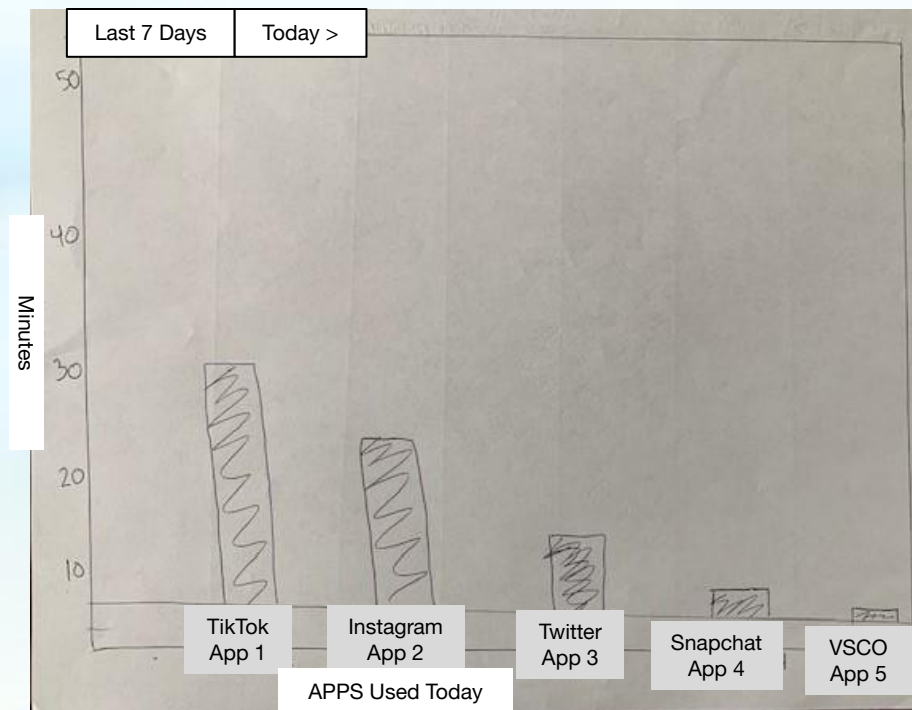
# Coordinating Multiple Representations

Phubster chose to use two bar graphs to show the amount of time a user spends on their phone during a scheduled appointment and how much of that time was spent using different apps. Coordinating between representations became an important issue during the competition that students often overlooked.

## Total Time



## By App



# Exposing Representations to Critique

Phubfun built three different representations to report how much time users spent on apps the users identified as “restricted.”

The process of building and coordinating representations created opportunities for rich mathematical discussions. For example, in the Weekly bar graph, Phubfun grappled with whether the “average” line (dotted) was consistent with their daily phubbing totals.

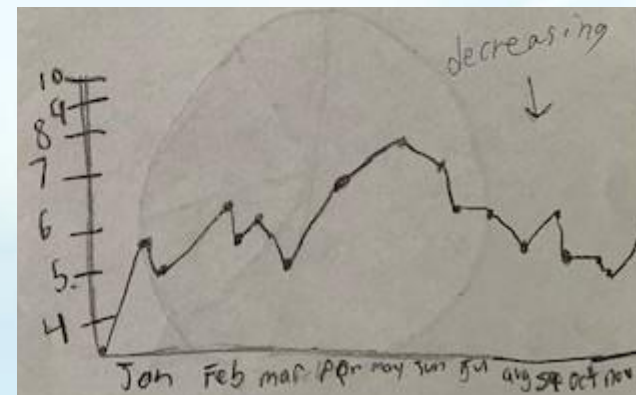
## Daily



## Weekly



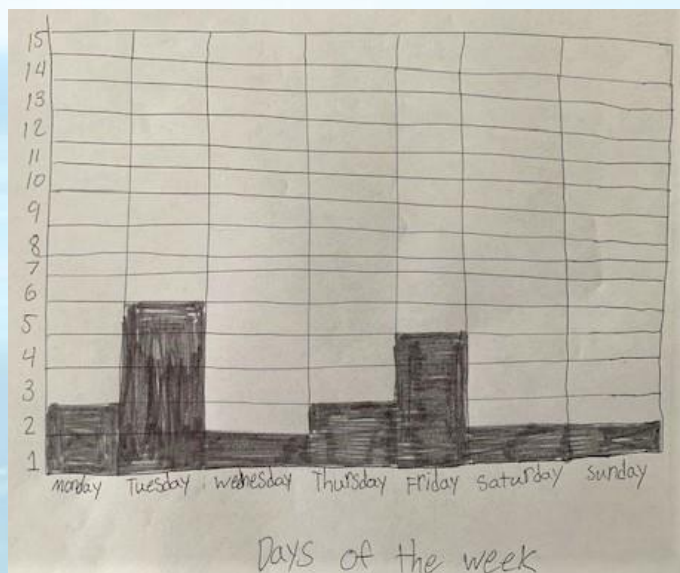
## Monthly



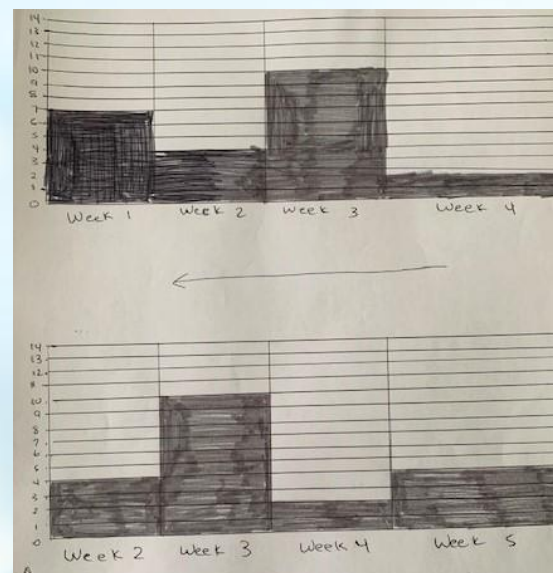
# Showing Improvement Over Time

TALK used bar graphs to represent the number of times a user touches their phone after the phone hears their name.

They included a representation for daily use and a representation for comparing phubbing across weeks. Like Phubfun, TALK needed to consider what “improvement” in phubbing would look like in their data representations.



**Daily**



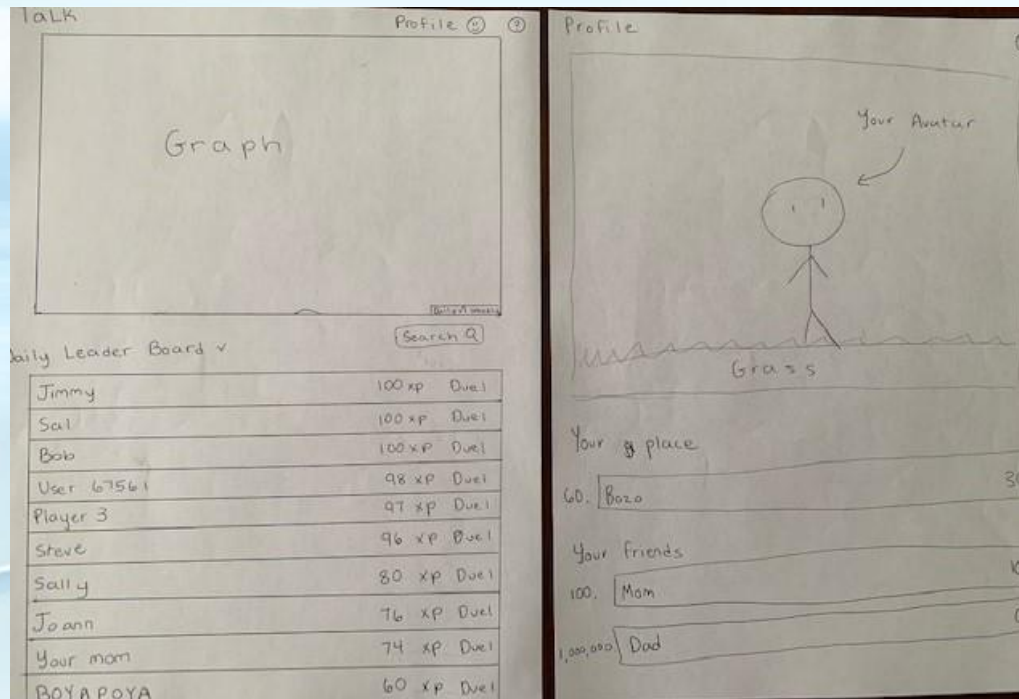
**Weekly**



# Going Beyond Data Representations

Teams went beyond the data representations, considering how to increase the appeal of their apps. This created opportunities for additional mathematics. TALK incentivized decreased phubbing and incorporated a social component by awarding points that could be used in a “duel” with friends.

## Gaming Dashboard

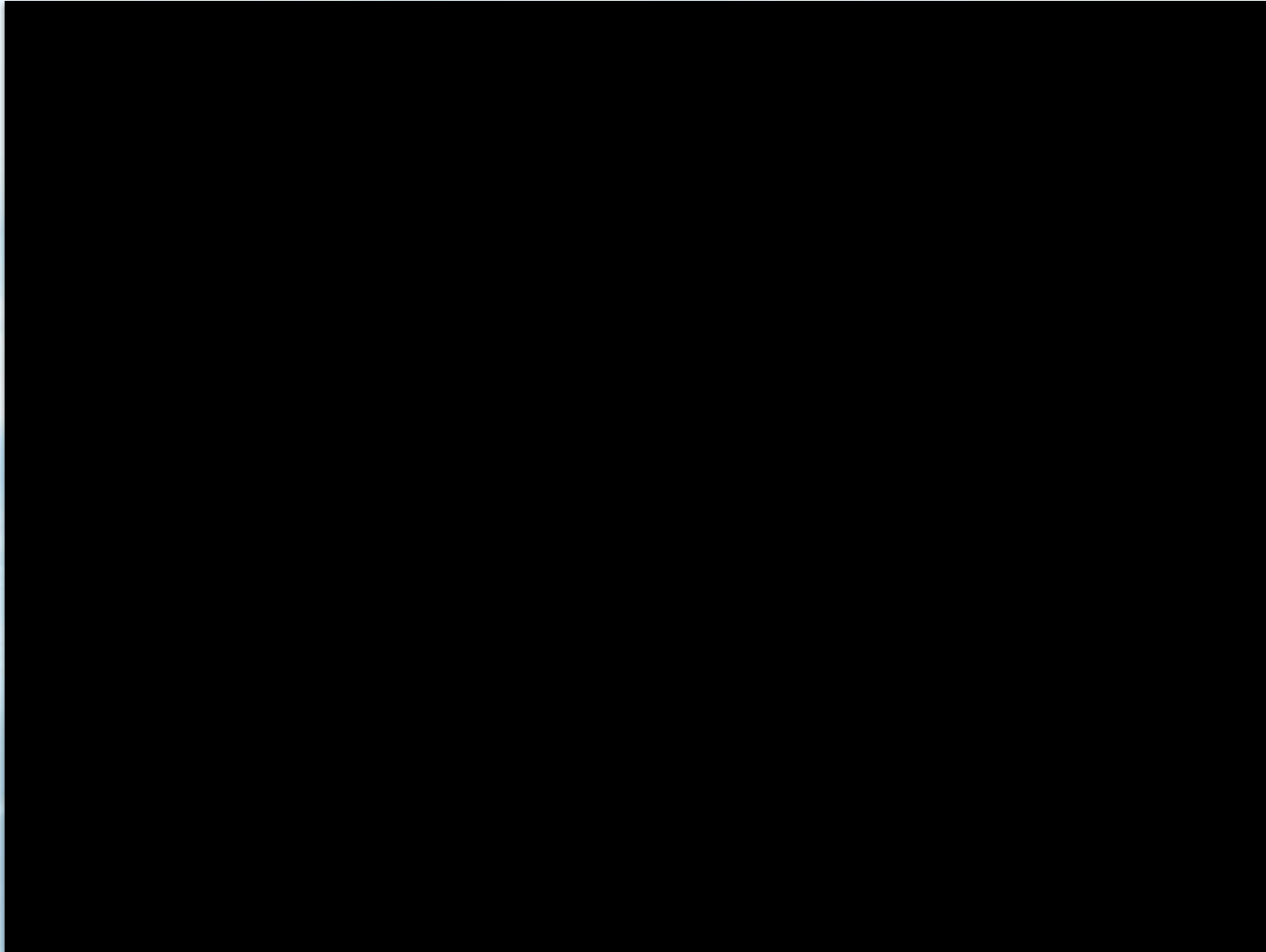


## Calculating Points

$$XP \leq 100, XP \geq 0, XP = 100 - P \cdot 10$$

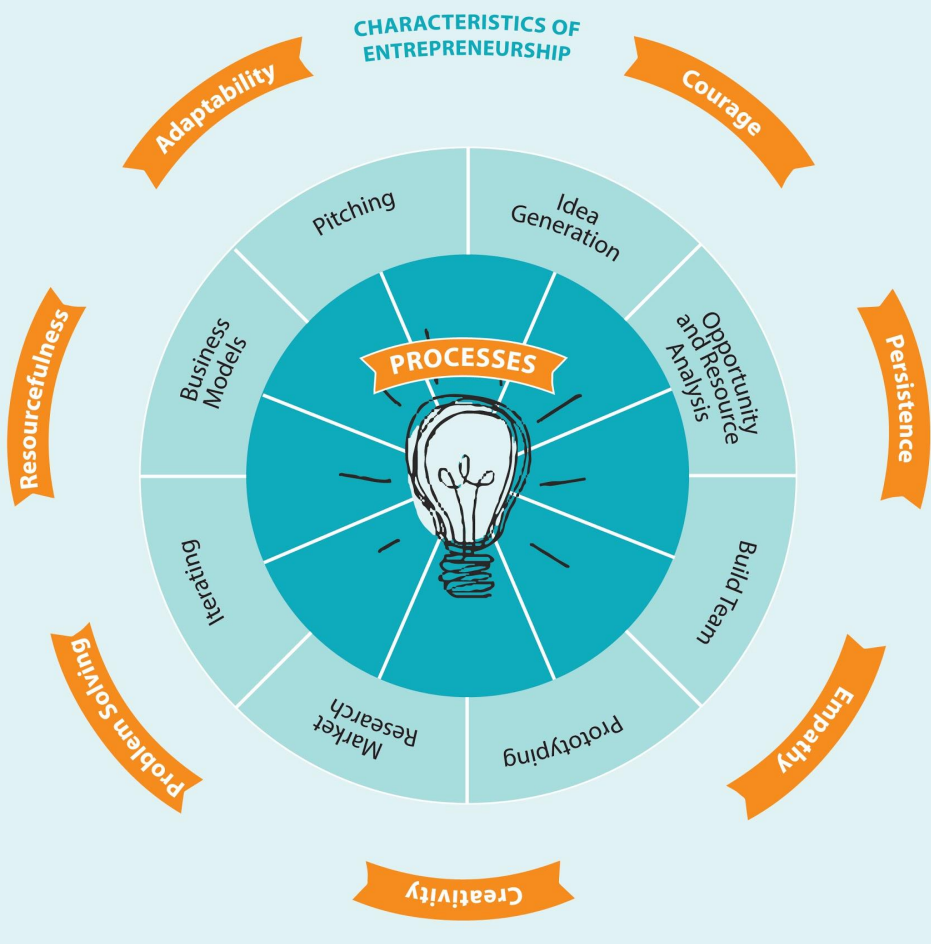


# Phubster Pitch





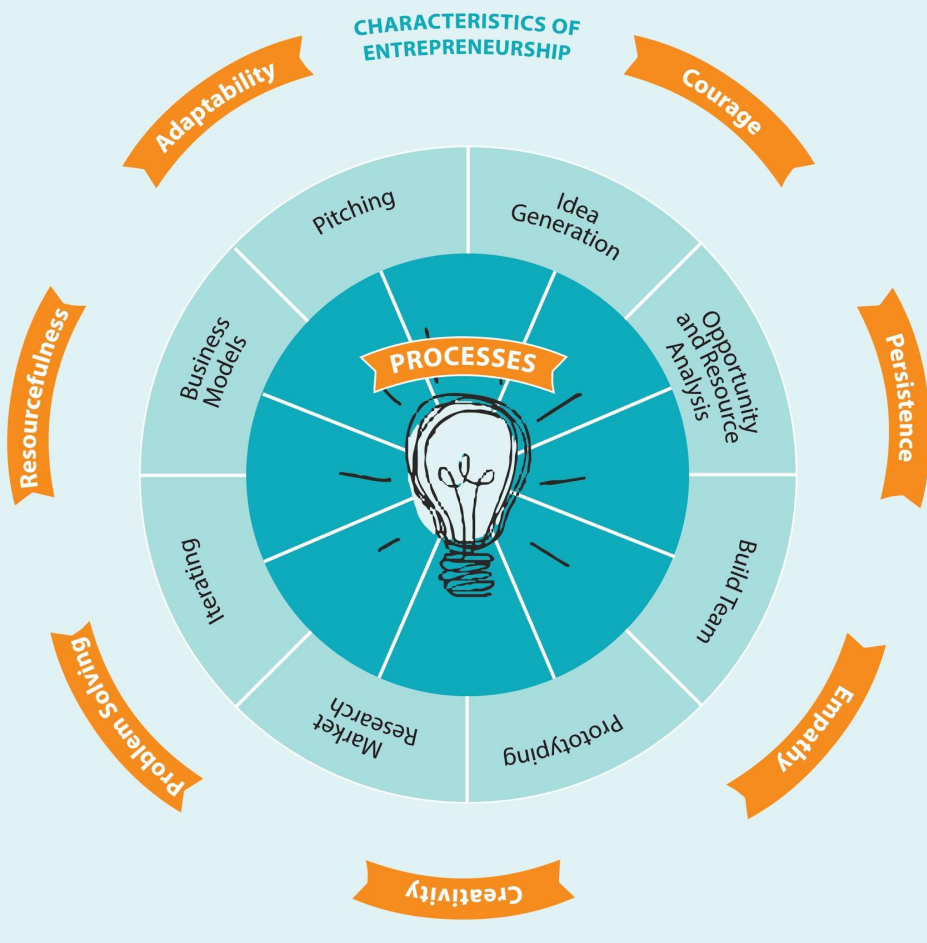
# Entrepreneurship, Engagement, and Opportunities for Math Learning



## Processes

- **Opportunity and Resource Analysis:** Creating ownership and empowering students as experts
- **Business Models:** Establishing the authenticity of the challenge
- **Pitching:** Providing an appealing outlet for sharing and defending work

# Entrepreneurship, Engagement, and Opportunities for Math Learning



## Characteristics

- **Empathy:** Establishing criteria for evaluating "correct"
- **Problem Solving:** Created opportunities for students to identify and simplify problems of interest
- **Persistence:** Investment promoted and supported persistence
- **Courage:** sharing and defending work takes courage



# Implementation Models

Challenges intended for in-person instruction (45 minute class periods), but allow for synchronous and asynchronous remote learning.

Day	Activities/Benchmarks
0	Launch the competition, introduce the components, and discuss entrepreneurship.
1	Launch the challenge (T) and begin researching and brainstorming solutions (S).
2	Introduce the technical brief and grading rubric (T). Continue researching and begin building prototype solutions and working on the technical brief (S).
3	Introduce (T) and begin working (S) on the Key Business Proposition (KBP).
4	Discuss (T and S) pitching and begin building (S) pitch decks. Conducts “expert” check-ins with teams (Teacher or school community member).
5	Finalize solutions and complete a practice pitch (S) with a pitch coach (school community member). Revise pitches based on feedback (S).
6	Deliver (or record) final pitches (S). Pick winners (school community members).



# Conclusions

## Entrepreneurship:

- Creates opportunities for students to solve problems by decentering and considering the needs of users.
- Supports engagement and empowers students to act on and take ownership of their solutions.
- Provides a unique and flexible approach to introducing students to career opportunities in STEM.





# Thank You!

Questions? Comments?

For more information, contact us at: [design\\_pitch@ncsu.edu](mailto:design_pitch@ncsu.edu)

## Partner with Us!

- We are looking for teachers to test the challenges with their students.
- All materials are **FREE** and we are offering a **FREE WORKSHOP**:
  - **August 3<sup>rd</sup> - 7<sup>th</sup>, 2020**
- If interested in partnering with us, please complete the Google form found by following the QR code below or using the link,  
<https://go.ncsu.edu/design-and-pitch-signup>

