Empowering Students in Math through Entrepreneurship

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#NCTM100
@EEkrupa
Project Staff, Partners, and Support

**Project Staff**

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Josh Mannix, Graduate Research Assistant

We gratefully acknowledge support from:

ITEST Grant number: 1759167

Materials for Design and Pitch Challenges have been authored by the SUDDS team and produced by Jason Learning
Jere’s Video
OECD 2030 Framework

(OECD, 2018)
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.

https://www.kinsahealth.co/releasing-soon-real-time-atypical-rt-metric/
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

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Champion Name</th>
<th>Title</th>
<th>Company/Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation Lifeline</td>
<td>Kris Ludwig</td>
<td>Scientist United States Geological Survey</td>
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<tr>
<td>Power Me Up</td>
<td>Kristin Vicari</td>
<td>Senior Chemical Engineer Tesla</td>
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<tr>
<td>Keep It Real</td>
<td>Cardell Patillo</td>
<td>Executive Director Mile High Kids</td>
<td></td>
</tr>
<tr>
<td>Building Algorithms</td>
<td>Cathy Yee</td>
<td>CEO &amp; Founder Incluvie</td>
<td></td>
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<tr>
<td>Prototype to Profit</td>
<td>Tyler Maloney</td>
<td>Materials Science Engineer &amp; Entrepreneur</td>
<td></td>
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<tr>
<td>Erase Food Waste</td>
<td>Oscar Ekponimo</td>
<td>Founder &amp; CEO Chowberry</td>
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Entrepreneurial Mentors

<table>
<thead>
<tr>
<th>Mentor Name</th>
<th>Title</th>
<th>Company/Role</th>
</tr>
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<tbody>
<tr>
<td>Gitanjali Rao</td>
<td>Inventor &amp; STEM Promoter</td>
<td></td>
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<tr>
<td>Kelsy Dominick</td>
<td>Designer &amp; CEO of DiDomenico Design</td>
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<tr>
<td>Clifford Okoth Owino</td>
<td>Founder &amp; CEO of Chemolex</td>
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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.

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

Visit https://sites.ced.ncsu.edu/design-and-pitch/challenges/keep-it-real/ to see the full set of materials for Keep it Real
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 side effects of smartphone use.
  16 Seriously Damaging Side Effects

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

Product
Describe your product.

Enhancing the Likes
Describe how your product enhances things customers like.

Customers
Describe your customers and what they do.

Fixing the Dislikes
Describe how your product fixes things customers dislike.

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
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**

- Last 7 Days
- Today

**By App**

- Last 7 Days
- Today

Days of Week: Su, Sa, F, Th, W, T, M

APPs Used Today: TikTok, Instagram, Twitter, Snapchat, VSCO
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.
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

Confrey, Krupa, & Belcher (2019)
# Implementation Models

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

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

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 3rd - 7th, 2020

• If interested in partnering with us, please complete the form found by following the QR code below or using the link:
  https://go.ncsu.edu/design-and-pitch-signup