Adapting Design Challenges for K-8

The Tech Interactive
San Jose, CA

We will be starting momentarily.
Tech Interactive - Intro Poll

We will be starting soon. In the meantime, please take our poll.

What is your experience with design challenges?
Adapting Design Challenges for K-8

The Tech Interactive
San Jose, CA

The Bowers Institute
Welcome

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Bowers Institute  
Professional Development Specialist

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Manager

Session Goals:

- Do a design challenge and share creations.
- Get facilitation tips for in-person and virtual implementation.
- Discuss techniques for adapting design challenges for K-8 students.

*This webinar is being recorded so we can share it later!
Agenda

1. Overview of Design Challenge Learning
2. Do a Design Challenge!
3. Techniques for K-8th grade
4. Strategies for Virtual Hands-on Learning
5. Q & A
A Design Challenge is..

Design challenges use real-world problems to engage learners in an iterative design process.
Key Features of Design Challenges

Solvable by **multiple solutions**.

Provide opportunities for **iteration**. Students can test and improve designs.

Connect with **participant interests**.

Make explicit connections to **real-world problems and careers**.
Content Connections

- **Science and Social Studies**: real world scenarios & guiding questions
- **SEL**: practice creativity, collaboration, perseverance
- **Science**: using vocabulary and applying concepts
- **ELA and NGSS**: persuasive writing and argumentation.
- **Math**: collecting and organizing data, using equations
- **Science**: using vocabulary and applying concepts
Let’s DO a Design Challenge!

1. Frame & Introduce
2. Prototype: Imagine, Create, Test & Reflect
3. Share Solutions
4. Debrief
Face Masks for Friends: Intro Video

Think about:
What user could you design a face mask for?

https://vimeo.com/420429737
Face Masks for Friends: Design Challenge

Design Problem:
Protect a user by designing a mask that fits their unique needs.

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
</tr>
<tr>
<td>Writing utensil</td>
</tr>
<tr>
<td>A “user”</td>
</tr>
</tbody>
</table>

https://www.thetechathome.org/facemaskforfriends
## Grade Level Adaptations

<table>
<thead>
<tr>
<th>User</th>
<th>3-5</th>
<th>6-8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K-2</strong></td>
<td>Interview a friend or family member</td>
<td>Research needs of front-line workers. <em>(may include an interview)</em></td>
</tr>
<tr>
<td><strong>3-5</strong></td>
<td>Include 3-5 distinct design features based on the interview.</td>
<td>Include 3-5 distinct design features based on multiple users in that category (ex farmworkers, nurses).</td>
</tr>
<tr>
<td><strong>6-8</strong></td>
<td>Include 2-3 distinct design features based on observation.</td>
<td>Include 3-5 distinct design features based on multiple users in that category (ex farmworkers, nurses).</td>
</tr>
</tbody>
</table>

### Constraints

<table>
<thead>
<tr>
<th><strong>K-2</strong></th>
<th><strong>3-5</strong></th>
<th><strong>6-8</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sketch Time: 15 min</td>
<td>Sketch/Build Time: 30 min</td>
<td>Sketch/Build Time: 20 min</td>
</tr>
<tr>
<td></td>
<td>Materials budget determined by teacher</td>
<td>Materials budget informed by research.</td>
</tr>
</tbody>
</table>
# Sample Users

<table>
<thead>
<tr>
<th>K-2</th>
<th>3-5</th>
<th>6-8</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name:</strong> Everest, pup</td>
<td><strong>Name:</strong> Erica, 1st Grade (little sister)</td>
<td><strong>Frontline worker:</strong> Farmworkers</td>
<td><strong>Choose your own user!</strong></td>
</tr>
</tbody>
</table>
| **User Interview:**  
- Lives in snow and ice  
- Runs and jumps a lot  
- Ears on top, long snout | **User Interview:**  
- Doesn’t like:  
  - things behind their ears  
  - getting glasses fogged up  
- Likes:  
  - elephants, rainbows, monster trucks | **User Research:**  
- Active work for 8-10 hours per day.  
- Heat and air quality are issues.  
- Need to remove for hydration breaks.  
- Straps can cause irritation if too tight or too loose.  
- Variety of sizes needed. |  |
| ![Everest, pup](image) | ![Erica, 1st Grade](image) |  |  |

## Who are you designing for?

[Resource: NPR Farmworkers Double Threat](link)
Option: Create and Share Online

Name: Michaela

My User:

Miss Fishbreath
- wants something cute and waterproof

Features I Included:
- Longer space for nose
- rubber straps
- waterproof fabric

Added extra strap after feedback from user

My Prototype:

Sharing Your Creations:
Pop a photo and description into this Google slide deck or try designing your mask there!

https://bit.ly/3mM8GJR
Interview Questions

**Daily life:**
- Describe your typical day.
- Where and how long would you be wearing the mask?
- What kind of activities will you do while wearing the mask?

**Pain points:**
- Are you already wearing a mask? If so, what is problematic about the design you currently use?
- If you have not been wearing a mask already, what do you think will make the design uncomfortable or unpleasant to wear?

**Positives and gains:**
- If you have been wearing a mask, what do you like? What works well about its design? Why?
- What features would you like the mask to have and why?
Sample User Interview

We wanted some insight from a face mask power user...

User Research with Dr. Mulgrew: https://vimeo.com/419081380

Stanford Children's Health

Tech Tips: Prototyping (PDF/Video) Data Collection (PDF)
Share Out

• Raise virtual hand and we will promote you to panelist.
• Choose gallery view on Zoom.
• Turn on your camera and make sure your device is visible.

Questions:
How did you design for a specific user?
What would you do to get feedback and improve your design?

Everyone else: Add helpful feedback and ideas about the design to chat.
Sharing Solutions

Agastya Foundation: Bangalore, India

How are the designs similar or different? How did they design for a specific user?
How would you adjust this activity for your grade level?
### Next Generation Science Standards Engineering Progression Summarized

#### Vocabulary / Concept Introduced
- **Design Problem**: Situation that people want to change or create.
- **Quantitative Data**: Data that can be measured and expressed numerically.
- **Qualitative Data**: Data that can be observed but not measured numerically.
- **Constraints / Variables**: Factors that limit or influence the project.
- **Trade-off**: Evaluating different options to find the best solution.

#### Skills Summarized

#### Define the Problem
- Simple problem situations that people want to change or create.
- Teacher-given problem situations that students understand by:
  - Asking questions
  - Making observations

#### Decompose / Create / Iterate
- Simple sketch or model
- Multiple solutions
- Identify failure points for aspects of design that can be improved.

#### Test / Reflect (Analyze)
- Teacher-led investigations
- Compare multiple solutions by:
  - Systematic evaluation processes
  - Including fairness with controlled variables and multiple tests

#### Share Your Solution
- Students make a claim about the effectiveness of a solution supported with evidence by:
  - Comparing observed data
  - Drawing conclusions based on observed patterns
  - Identifying relevant evidence about how it meets the criteria of constraints

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**Created by The Tech Interactive, 2019**
# Introducing Challenges

<table>
<thead>
<tr>
<th>Frame</th>
<th>K-2</th>
<th>3-5</th>
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<tbody>
<tr>
<td></td>
<td>Picture books &amp; stories</td>
<td>Video or photos</td>
<td>Students conduct research to define the problem and create the criteria and constraints.</td>
</tr>
<tr>
<td>Virtual Setting</td>
<td>Introduce synchronously with short fun prompt and examples.</td>
<td>Introduce asynchronously via video, prompt and resources.</td>
<td>Send handout and instructions. Include graphic and video resources where possible.</td>
</tr>
</tbody>
</table>

Tech Tip: Framing the Challenge ([PDF](#)/[Video](#))
## Imagine, Create, Test & Reflect

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<td><strong>Prototype</strong></td>
<td>Provide extra time to play with the materials and discover how they work.</td>
<td>Scaffold testing and iteration. Short build times with opportunities to share and view progress of others throughout.</td>
<td>Multiple iterations based on clear feedback/data. Focus on innovator mindsets (<em>collaborative, bold, perseverant, empathetic, curious).</em></td>
</tr>
</tbody>
</table>
| **Journals**  | Drawings and sentence prompts, simple emojis to share their feelings/experience | Record the process:  
• What did you change?  
• What would you change with more time? | Detailed journals with data to capture research and test results (*measurements, schematics etc*) |
| **Virtual Setting** | Check-in with adults during prototyping. | Model through synchronous prototyping. Complete asynchronously. | Breakout rooms and shared documents to encourage collaboration. |

### Tech Tips: Prototyping (PDF/Video)
Data Collection (PDF)
# Sharing Solutions

<table>
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<tr>
<th>Share</th>
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<tr>
<td>Circle time, show and tell style.</td>
<td>Use feedback prompts (ex: Wows and Wonders)</td>
<td>Formal presentations. Include special guests or community members where possible.</td>
<td></td>
</tr>
<tr>
<td>Students submit photos or videos (via text, Flipgrid, Padlet, See Saw etc) of their designs. Teacher collects into one place for all students to view. Debrief live with small groups or whole class.</td>
<td>Gallery “walk”, sharing and discussion during video session.</td>
<td>Online tools to summarize learning (ex webpage, blog, slide deck). Share out session with stakeholders (ex frontline workers, mask manufacturers, epidemiologists).</td>
<td></td>
</tr>
</tbody>
</table>

💡 Tech Tip: Sharing Solutions (PDF/Video)
Remind Yourself:

You are learning and iterating too!

- Be flexible.
- Vary your strategies.
- Test and reflect.

Think about: What will you try next?
Resources

- Educator Resources: thetech.org/resources
- Parent Guides and Videos: thetech.org/athome
- Spanish Guides and Videos: thetech.org/en-casa
# Back to School Resources

<table>
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<th>K-2</th>
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<th>6-8</th>
</tr>
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<tbody>
<tr>
<td>Paper Skyscraper (Student Resources)</td>
<td>Materials Treasure Hunt (Student Resources)</td>
<td>Get in the Game (Student Resources and Educator Lesson)</td>
</tr>
</tbody>
</table>

- **Biomaking Algae String**  
  Oct 27  
  4-5 PST

- Check out our Upcoming Professional Development!

- **Building Empathy through Narratives**  
  Dec 8  
  3:30-4:30 PST

**Tips for Distance Learning**  
(Educator, Parent)
Exit Survey

We need your feedback!

Bit.ly/DCL527
Q & A

The Bowers Institute
Thank you!

Stay in touch!
BowersInstitute@thetech.org