ENGINEERS WEEK 2025: ENGAGING KIDS IN ENGINEERING

January 22, 2025

Presenter:

Sarah Moore
Marketing Manager
(Former Teacher)

DISCOVER
ENGINEERING

Presenter:

Thea Sahr

Executive Deputy Director

DiscoverE

Who is DiscoverE?

- We are the "E" in STEM

- We support educators and volunteers to:

  - Build Skills and Confidence

  - Increase Interest and Knowledge

  - Expand Opportunities

MAKING A DIFFERENCE

Resources

- **170 STEM Activities**
  - **Leader Notes**
  - **Student Instructions**
  - **Challenge Videos**
- **Career Exploration**

- **Leader Training**
- **Outreach Grants**
- **Programs**
  - **Turn-key**
  - **Create Your Own**
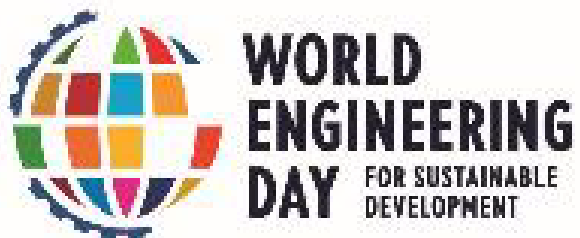
ENGINEERING IS FOR EVERYONE

Today's Agenda

- What Students Think about Engineering

- Building a Student's STEM Identity

- Talking About Engineering

- Engineering Design Process

- Active facilitation

- Role Models

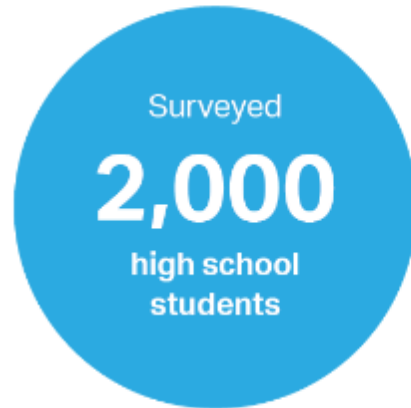- Bringing it all together

- Free Resources

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2023 Messages Matter: Research Findings

Methodology

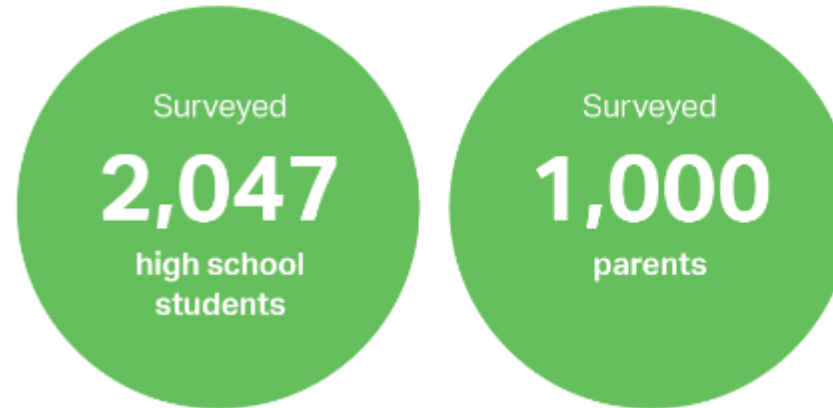Global Strategy Group conducted two rounds of nationwide online surveys.

Round One
May 3 – 17, 2022

Surveyed
2,000
high school students

Round Two
October 6 – 13, 2022

Surveyed
2,047
high school students

Surveyed
1,000
parents

Student Surveys:
The margin of error at the 95% confidence level is +/- 2.2%.
The margin of error on sub-samples is greater.

Parent Survey:
The margin of error at the 95% confidence level is +/- 3.1%.
The margin of error on sub-samples is greater.

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# Perceptions of and Interest in Engineering

1 Engineering has a **"concrete" image** and a **gender divide** when it comes to students' interest.

2 **18% of students are very interested in a career in engineering**

- 53% are somewhat or a little bit interested
- 30% are not interested

3 **Students think engineering is hard and requires skills they may not have.** Their top three descriptors are:

- Good at math and science

- Smart

- Builds, constructs, and makes things
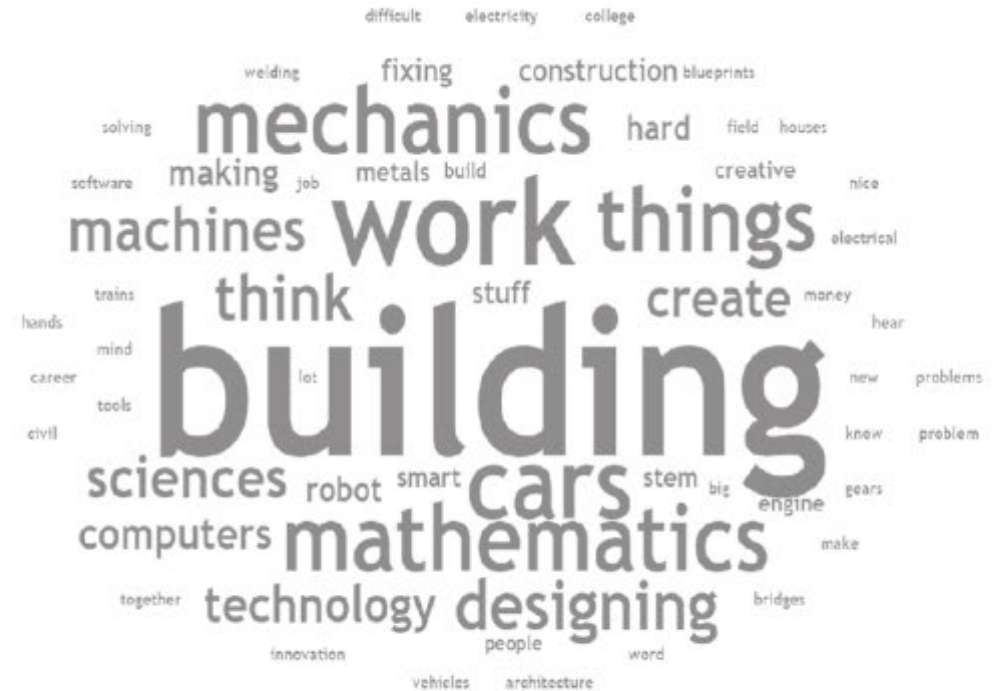
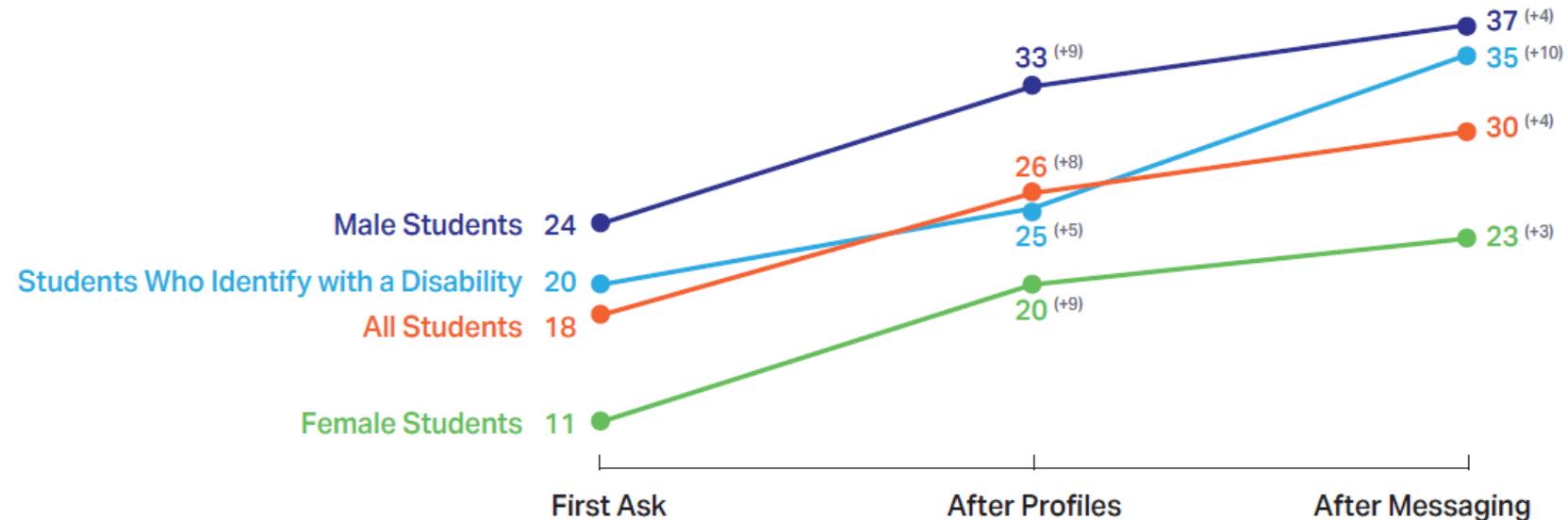Words students use to describe engineering.

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Career Influencers and Priorities

1 **Parents can be allies** in promoting careers in engineering.

2 **Parents** are students' **most trusted career advisors.** Adults who *"work in a field I would consider"* and close friends are the third most trusted career influencers.
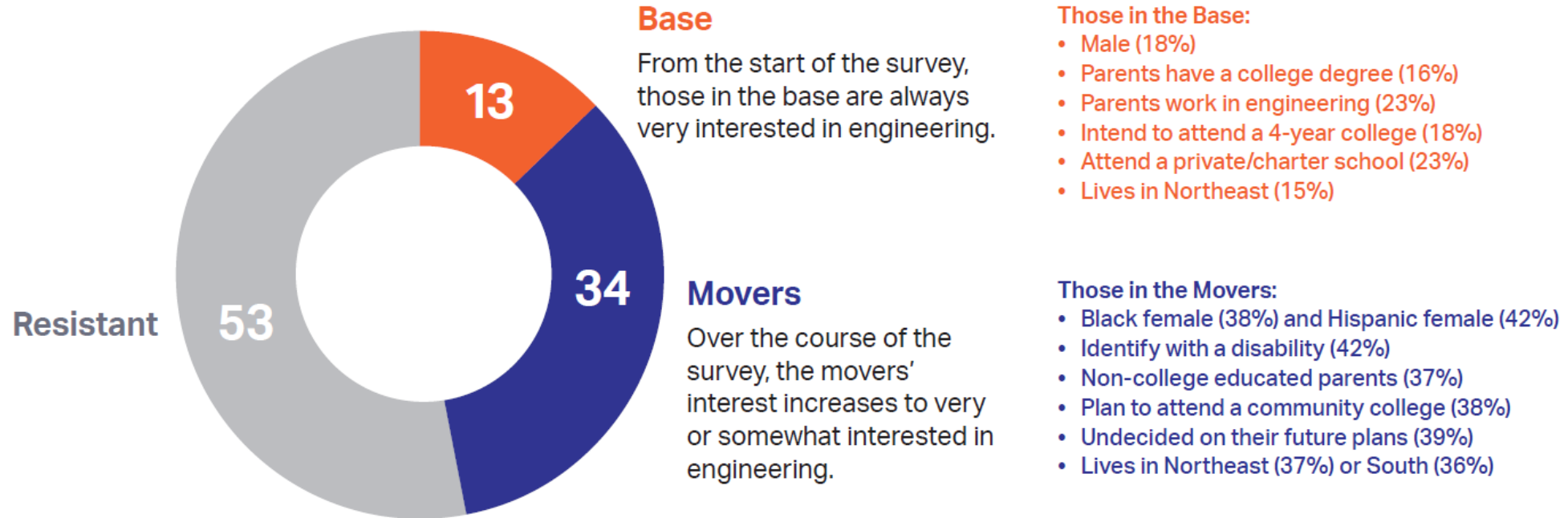
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Appealing Messages, in Combination with Engineering Profiles, Increase Student Interest

How interested are you in pursuing a career in the field of engineering? %Very Interested

- Male Students: First Ask 24, After Profiles 33 (+9), After Messaging 37 (+4)
- Students Who Identify with a Disability: First Ask 20, After Profiles 25 (+5), After Messaging 35 (+10)
- All Students: First Ask 18, After Profiles 26 (+8), After Messaging 30 (+4)
- Female Students: First Ask 11, After Profiles 20 (+9), After Messaging 23 (+3)

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The Movers – students whose interest increases with exposure – are made up of historically underrepresented groups in engineering and tech.

Base

From the start of the survey, those in the base are always very interested in engineering.

Those in the Base:
- Male (18%)
- Parents have a college degree (16%)
- Parents work in engineering (23%)
- Intend to attend a 4-year college (18%)
- Attend a private/charter school (23%)
- Lives in Northeast (15%)

Movers

Over the course of the survey, the movers' interest increases to very or somewhat interested in engineering.

Those in the Movers:
- Black female (38%) and Hispanic female (42%)
- Identify with a disability (42%)
- Non-college educated parents (37%)
- Plan to attend a community college (38%)
- Undecided on their future plans (39%)
- Lives in Northeast (37%) or South (36%)

Resistant 53
13
34

Ahmed and Khalil Abdullah are brothers and video game designers who founded multi-aware winning game company Decoy Games after both studying computer science at UMass Amherst. Using their combined computer science knowledge, and online tutorials about video game development, they created their first video game *Swimsanity!.*

"Because **I have a brother** and we are really close and we **love playing video games** and **we wish we could create our own someday**."
– Male, Black, age 15

"I enjoy video gaming and didn't **realize that engineering was behind it**."
– Male, Hispanic, age 17

"They **look like me and people in my community** and I love the gaming part as I love gaming with my friends."
- Male, Black, age 15, identify with a disability

Most interesting to:
- **Male students**
- **Black and Hispanic male students**
- **Students who identify with a disability**

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Jade Raymond is a video game designer and computer engineer known for her work on The Sims Online and for leading the team that developed Assassin's Creed. She is the CEO of Stadia Games and Entertainment, and the founder of Ubisoft Toronto, and Motive Studios.

"**Her job includes video games which I love**, and she's created a couple games that I love. **She's also a woman** so I thought that was cool and her experience was good too."
– Female, Asian, age 15

"**Her job would be so much fun**, designing video games though I know it's hard would allow you to be **creative** and have fun with it."
– Female, White, age 16

"**Because I am physically handicapped**, the idea of designing video games is appealing because it **wouldn't be such a physical job**."
– Male, White, age 14, identify with a disability

Most interesting to:
• **Mover target group**
• **Students who Identify with a disability**

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1. **Engineering is a career that is "open to everyone"**

    While highly appealing across all demographic groups, but not everyone believes that it is true.

2. **Engineering is a "well-paid and prestigious field" that "sets students up for success"**

    Is both appealing and believable and speaks to concerns that both parents and students have about finances.

3. **Engineers can make "a world of difference"**

    A top testing message from Changing the Conversation, the updated message is still an appealing and believable message for both parents and students.

Not all paths to a career in engineering require a degree. This is news.

- Over half of students and parents initially believe that a Bachelor's degree is necessary for a career in the field of engineering

Download The Message
Matter Report

DiscoverE.org/messages-matter

Keys to Building a Student's STEM Identity

- Increase their interest

- Nurture curiosity with a positive attitude

- Help them see the value in STEM and how it aligns with their values and goals

- Build their confidence in their STEM skills

- Provide strong support networks

- Help them feel a sense of belonging

Formula for Success

Share positive engineering messages

+

Do Hands-on Activities & Active Facilitation

+

Support Interactions with STEM Role Models

_____

= STEM Positive Students

Talk About Engineering & Tech

Most students don't know what engineering is.

Share how engineering is:

- Well-paid
- Open to everyone!
- Creative
- All about teamwork
- Making the world a better place.

Adjusting the Engineering Image

Share images of people:

- Girls tend to gravitate toward image of people and female engineers
- Boys more likely to pick images that features "things"

Engineering Is Open to Everyone

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Formula for Success

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= STEM Positive Students
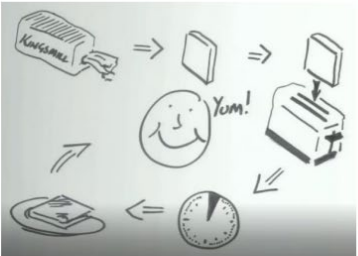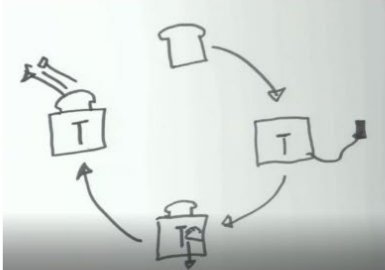
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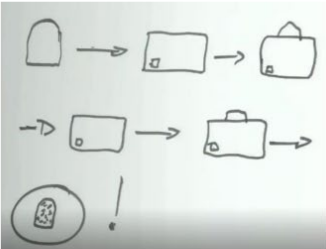
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- Pen or pencil
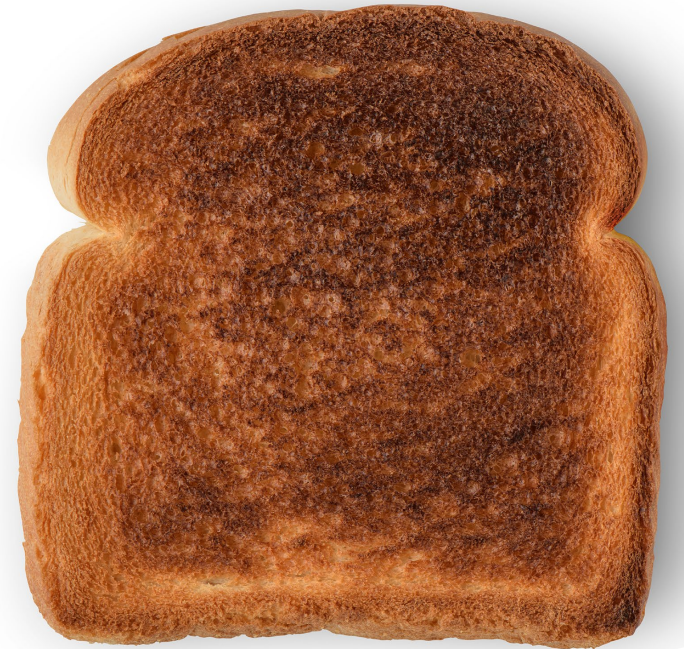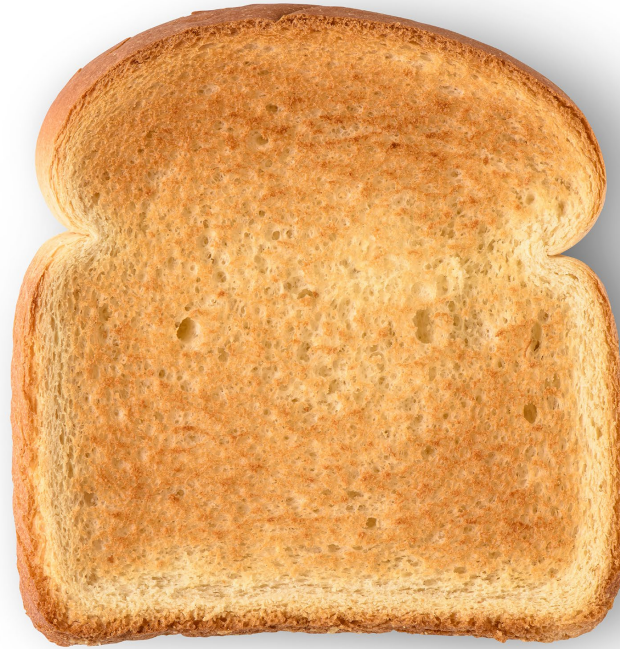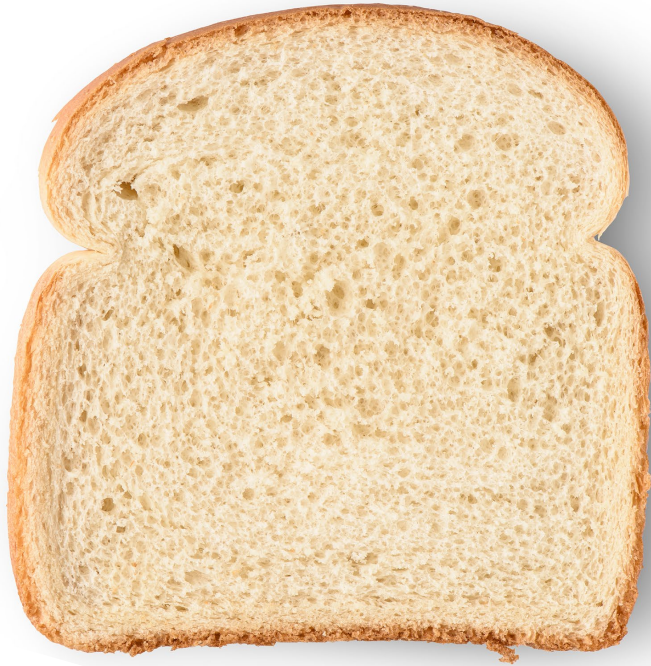
Instructions | Draw how to make toast

How did you make toast?
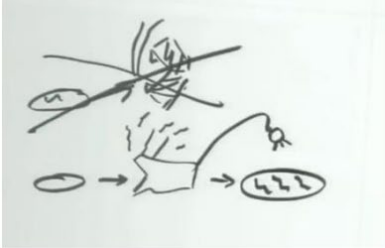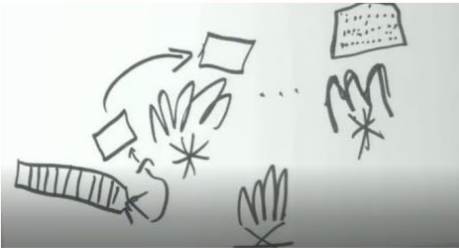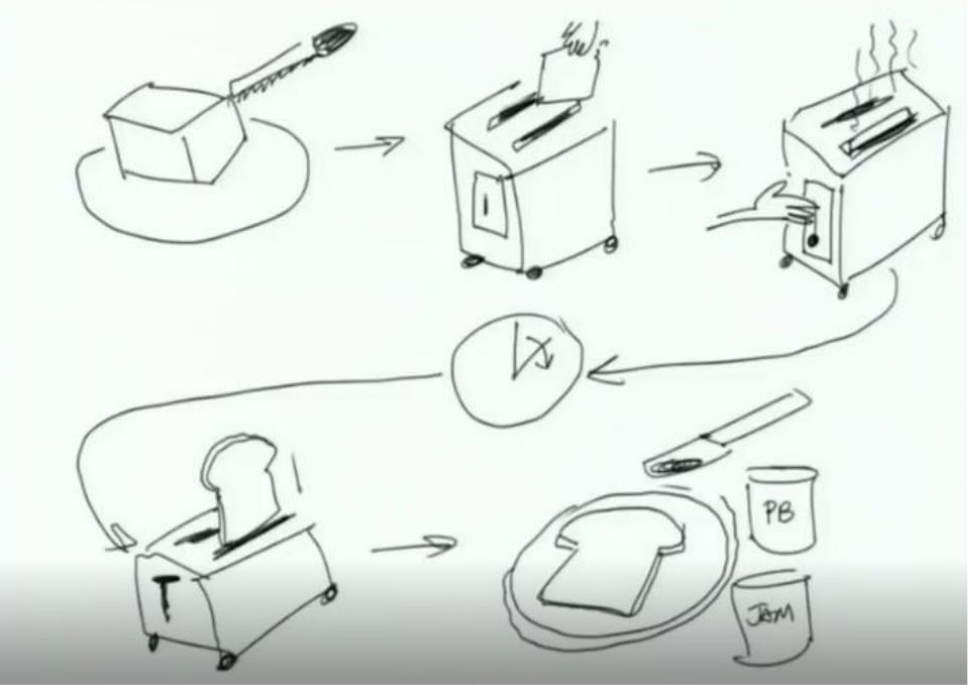
Burnt Toast?

Engineering Design Process

Identify the Problem

Learn the Specifications

Brainstorm Solutions

Design It

Test, Improve, Redesign

Build It

Share It
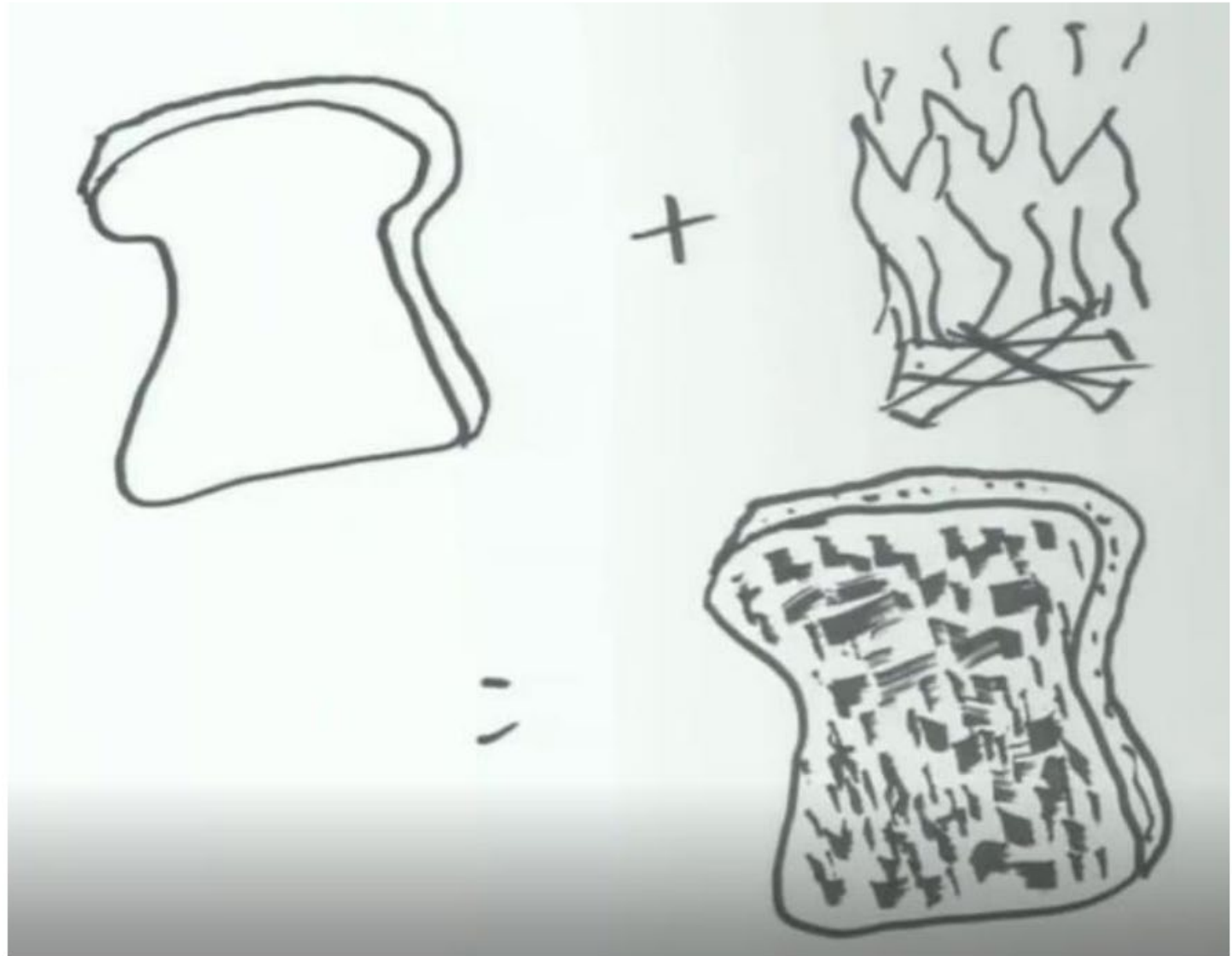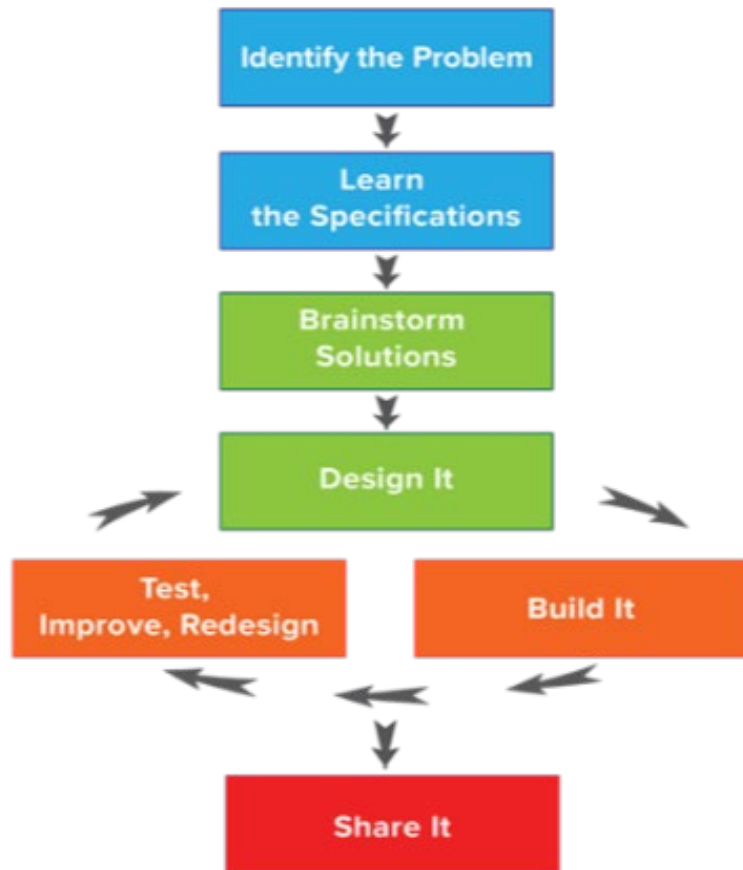
Problem: Make Toast

Specs: What problem am I solving? What resources do I have? What's the budget? How much time do I have? Who's on my team? Who's my client? How will success be measured? What are my constraints?

Brainstorm: What do I know I already know? What do I need to learn? What materials do I have? What have others done?

Design/Build/Test: What idea do I want to try first? Did it work like I thought it would? What didn't work? What can I improve?

Share: What worked, what didn't? What would you do differently? What are your favorite features. What did you like about other teams' designs?

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Build a Bridge

The Challenge

Put your engineering skills to the test by constructing sturdy bridges using just paper and aluminum foil.

Engineering Constraints

- 1 Piece of paper *OR* 1 piece of tinfoil
- The bridge spans a distance of 6 inches.

Success Criteria

- The bridge supports at least 40 pennies.

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Facilitating an Activity

- Ask leading questions ... rather than telling them what do do.

- Start with where, why, how might you

- Praise children for effort.
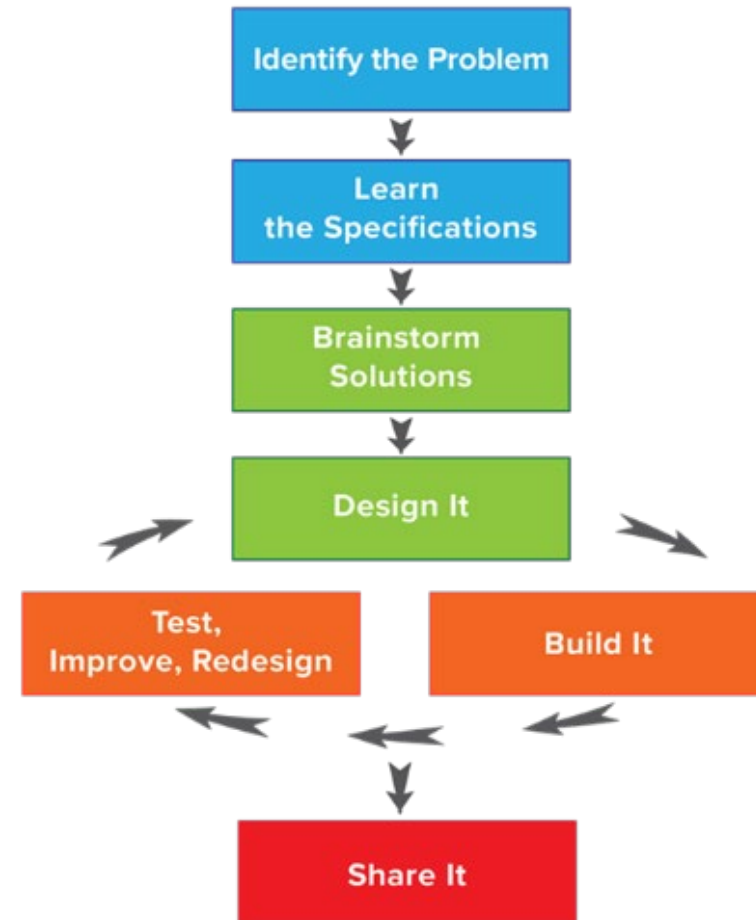
- Highlight the struggle.

Step 1: Identify the Problem

Getting Ready to Lead

- Do the activity yourself.
- Identify the learning goal.
- What are the connections to real-world engineering?

Build a Bridge Application

- How would you introduce Build a Bridge?
- What are the learning goals?
- What problem(s) needs to be solved?
- Who benefits?

Step 2: Learn the Specs

- Getting Ready to Lead

  - Identify engineering constraints and what success looks like.
  - Brainstorm extension ideas

Build a Bridge Application

- What are Build a Bridge's constraints?
- How much weight does it need to hold?
- Why do structures need to support weight?

Step 3: Brainstorm

Getting Ready to Lead

- How can you encourage a high-energy, free-flow of ideas with your kids?
- What strategies can you try if kids argue or criticize each other?
- How can you get everyone to participate?
- How can you encourage students to explore the materials before they start building?

Build a Bridge Application

- Ask Questions
  - What material do you want to use? Why?
  - What are the uses, advantages, drawbacks of each material?
  - How might you make your paper or tin foil stronger?

Step 4: Design

Getting Ready to Lead:

- How can you help kids choose the best ideas & get ready to build?

- How can you help kids understand the value of designing *before* they build?

Build a Bridge Application

- What kind of questions can you ask?

Step 5: Build, Test, Redesign

Getting Ready to Lead
- Be prepared -- it's loud, it's messy, it's educational
- Establish a testing zone
- What are some techniques for tactfully directing your kids toward a better design?
- What are some ways to keep your kids from getting discouraged if their designs don't work?
- Don't let them stop! What improvements can they make? What extra challenges do you have up your sleeve?

Build a Bridge Application

- What questions can you ask?
- Praise effort, not outcome – Why?

Step 6: Share It

Getting Ready to Lead

- Leave time to clean up, summarize and reflect on results

Build a Bridge Application

- What worked, what didn't?
- What would you do differently?
- Ask kids to talk about their designs and their favorite features. What did you like about other teams' designs?
- **Connect the big idea** of the activity back to the real world.
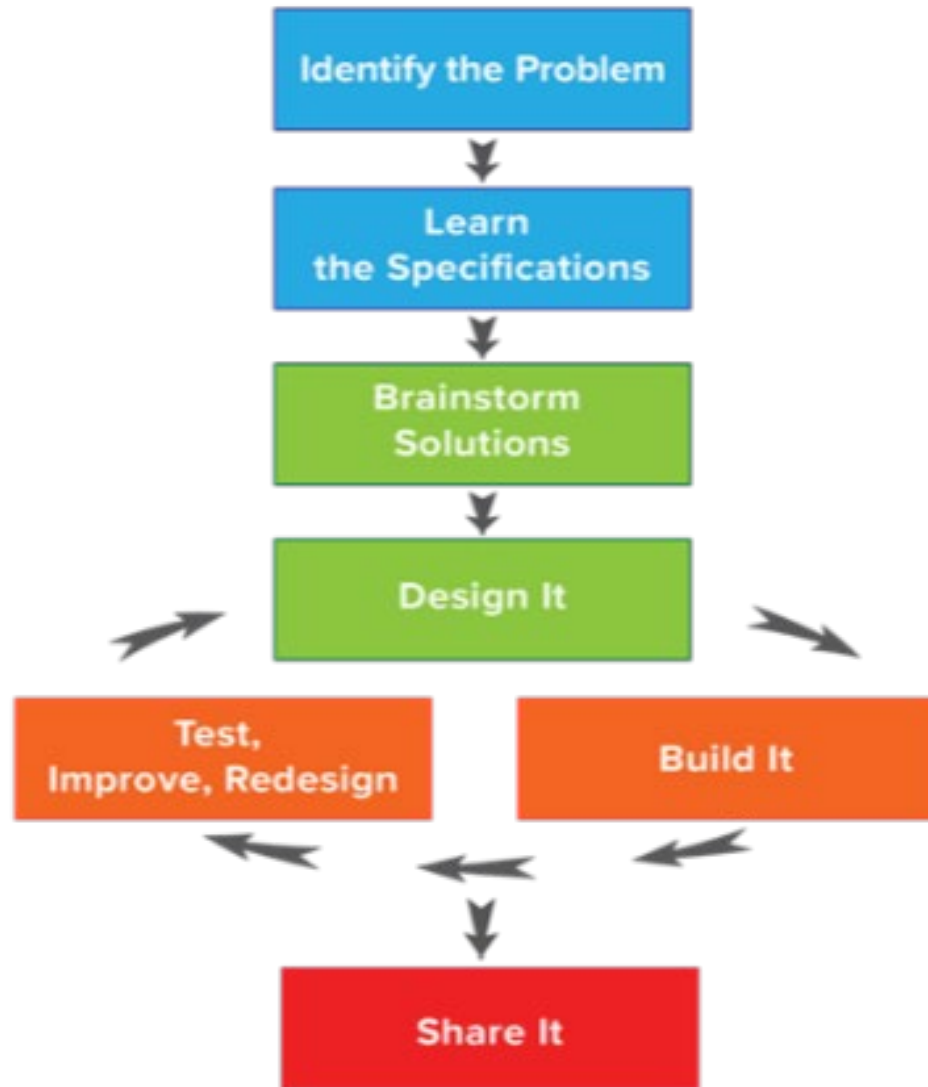- What do you know now that you didn't know before the activity?

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Action: Do Engineering Activities

- Build Confidence

- Develop Early Interest

- Align Values

- Sustain Positive Attitude
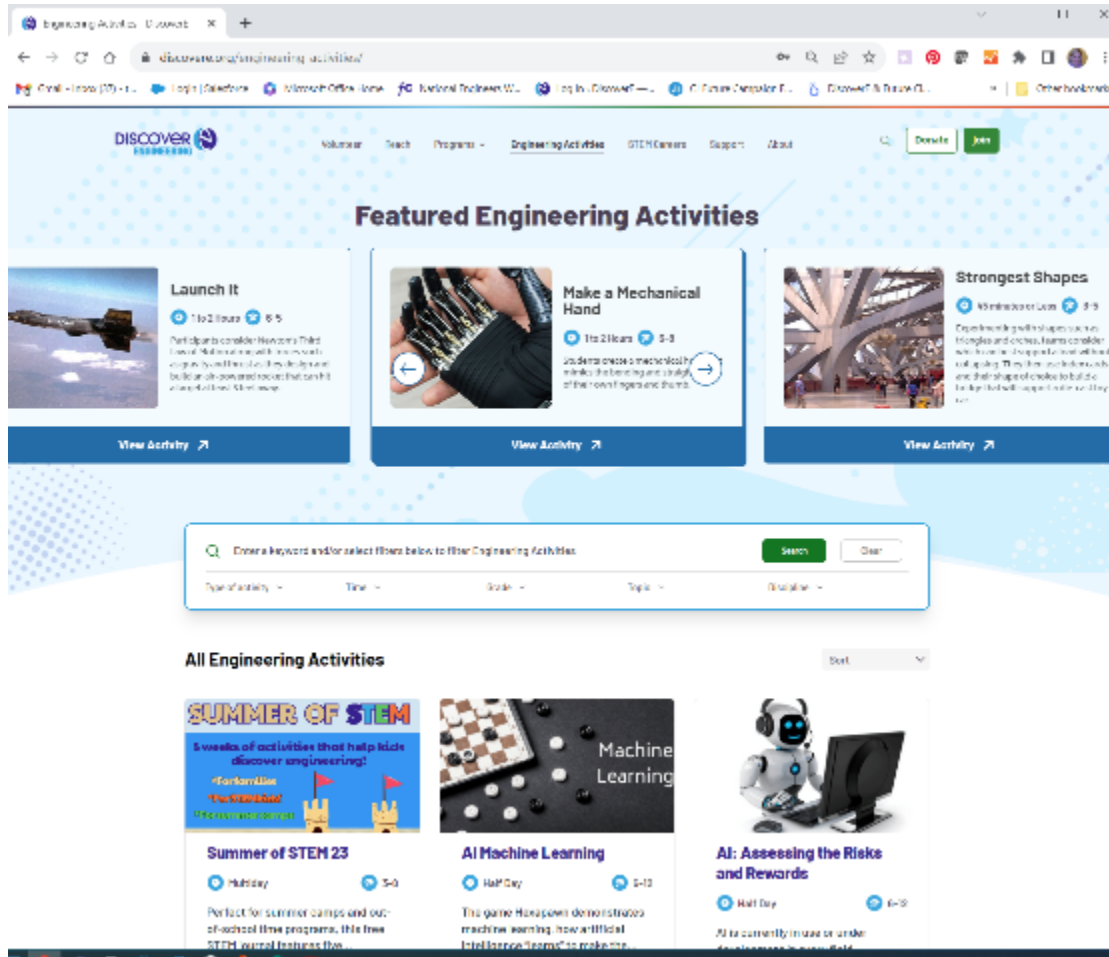
- Create Belonging

Engineering Design Process

Choosing Activities

- It is a demo or hands-on?

- Is there a purpose?

- Does it follow the Design Process?

- Can you weave in the engineering messages?

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Finding STEM Activities – DiscoverE.org

Formula for Success

Share positive engineering messages

+

Do Hands-on Activities & Active Facilitation

+

Support Interactions with STEM Role Models

_____

= STEM Positive Students

Action: Connect Students with STEM professionals

Critical Need

- 74% of educators report that their students do not have many opportunities to meet an engineer or technical professional.

- 84% of educators and 87% of volunteers say it helps their students learn about engineering careers.

Action: Connect Students with Role Models

Factors Addressed:

✓ Develop confidence

✓ Promote interest in STEM

✓ See value in engineering

✓ Develop networks

✓ Build sense of belonging

DiscoverE.org

Finding STEM Volunteers

- Local Engineering Societies (SWE, ASCE, CIE, etc)

- Local universities

- Local engineering firms

Connecting with Educators & Volunteers

Finding Teachers and Adult Youth Leaders

- Classroom teachers and after-school groups need support

- Look beyond your community – are there schools or organizations who might need more support?

- Does your company or association have a local relationship?

Finding STEM Volunteers

- Parents, neighbors, former students

- Local engineering societies (SWE, ASCE, IEEE, ASME, CIE, etc)

- Local universities

- Local engineering firms

- **Resources**

  - **170 STEM Activities**
  - **Challenge Videos**
  - **Career Pathways**

  - **Posters, Ads & Artwork**
  - **Photo Library**
  - **Outreach Grants**

Goal: Celebrate engineers and inspire students

Ask: Volunteers and educators engage students & celebrate the work of engineers

Resources:
STEM Activities
Training
Invite An Engineer Guide
Planning Guide
Certificates
Social Media Posts & Graphics

DiscoverE.org/EngineersWeek

Engineers Week
Feb 16-22, 2025
DESIGN YOUR FUTURE
DISCOVER E ENGINEERING

Goal: Inspire girls to explore engineering

Ask: Engage girls in engineering – year round

Resources: Girl Day Planning Guide
Stickers
STEM Activities

DiscoverE.org/GirlDay

- Student host interviews engineers and technicians

- Meet role models

- Career exploration

Discovere.org/programs/chats-with-change-makers/

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CHATS WITH CHANGE MAKERS

MEET JAMES DOUGHERTY
ELECTRONIC TEST TECHNICIAN

James operates robotics to help create lasers, antennas and high-power microwave circuits.

Official Partner: RTX

Thurs Jan 23 1PM US ET

> REGISTER NOW

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What is Future City?

Students work in teams with an educator and STEM mentor to create cities that exist 100 years in the future.

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Get involved!

As an educator
Facilitate your team(s) learning

As a judge
Be amazed at students' innovative solutions

As a mentor
Pass along your professional STEM experience and knowledge

As a volunteer/special award
We can't do it without our volunteers

Visit: FutureCity.org

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