Museum of Science

EiE

Support English Language Learners in STEM Education through Engagement in Engineering Challenges

Your Facilitator

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Introductions

- Who is in the audience?
- Where are you from? (districts, organizations)
- What grade level(s) do you work with?
- What are your expectations at this STEM conference?

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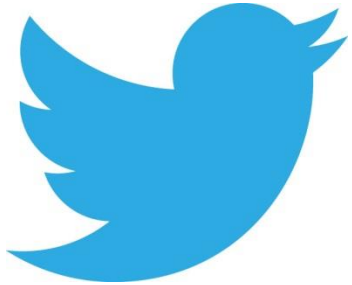

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Session Goals

- Engage in a hands-on, authentic engineering activity to reflect on how to provide meaningful opportunities that engage *all* students.
- Explore how engineering can provide opportunities for authentic discourse to support English-language development.
- Identify strategies that scaffold language development during authentic engineering activities

Something to Think About:

- What do you think deeper learning in science looks like?
- How do you know when it happens?
- What does it take to accomplish?

What is Authentic Discourse?

- How do we communicate with each other?
- What scaffolds do our students need to engage in discourse?
- As we go through this session, pay attention to what supports you notice embedded in this activity.

How did we get here?

What were the experiences that led to Lesson 3?

Let’s quickly review the previous lessons.

Now we are caught up and ready to proceed to lesson 3!

Engineering Sails

Design Challenge:
Engineer a sail that travels as far down a sail track as possible using limited materials.

Real Sailboats

The Set-Up

Materials

MUST use:

- Craft stick (as mast)

Can use:

- Aluminum foil
- Coffee stirrer
- Copy paper
- Craft sticks
- Dixie cups
- Felt
- Index cards
- Tape
- Tissue paper
- Wax paper

- **TOOLS:**
- Ruler
- Scissors

Properties of Sail Materials

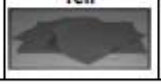
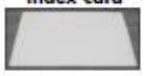
Object/Material	Properties	Predict effectiveness as a sail material
Aluminum foil		
Index card		
Felt		
Tissue paper		
Plastic bag		
Cup		
Paper		
Wax paper		

Name: _____ Date: _____

B

Be a Mechanical Engineer!

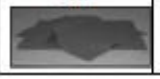
1. Circle the **material(s)** you predict will work well in a sail design.

aluminum foil 	paper 	plastic bag 	wax paper 
tissue paper 	cup 	felt 	index card 

Why do you think so?_____

_____

2. Put an "X" through the **material(s)** you predict will NOT work well.

aluminum foil 	paper 	plastic bag 	wax paper 
tissue paper 	cup 	felt 	index card 

Why not?_____

_____

3. Circle the shape(s) you predict will work well for a sail.

square 	triangle 	circle 	other

Why do you think so?

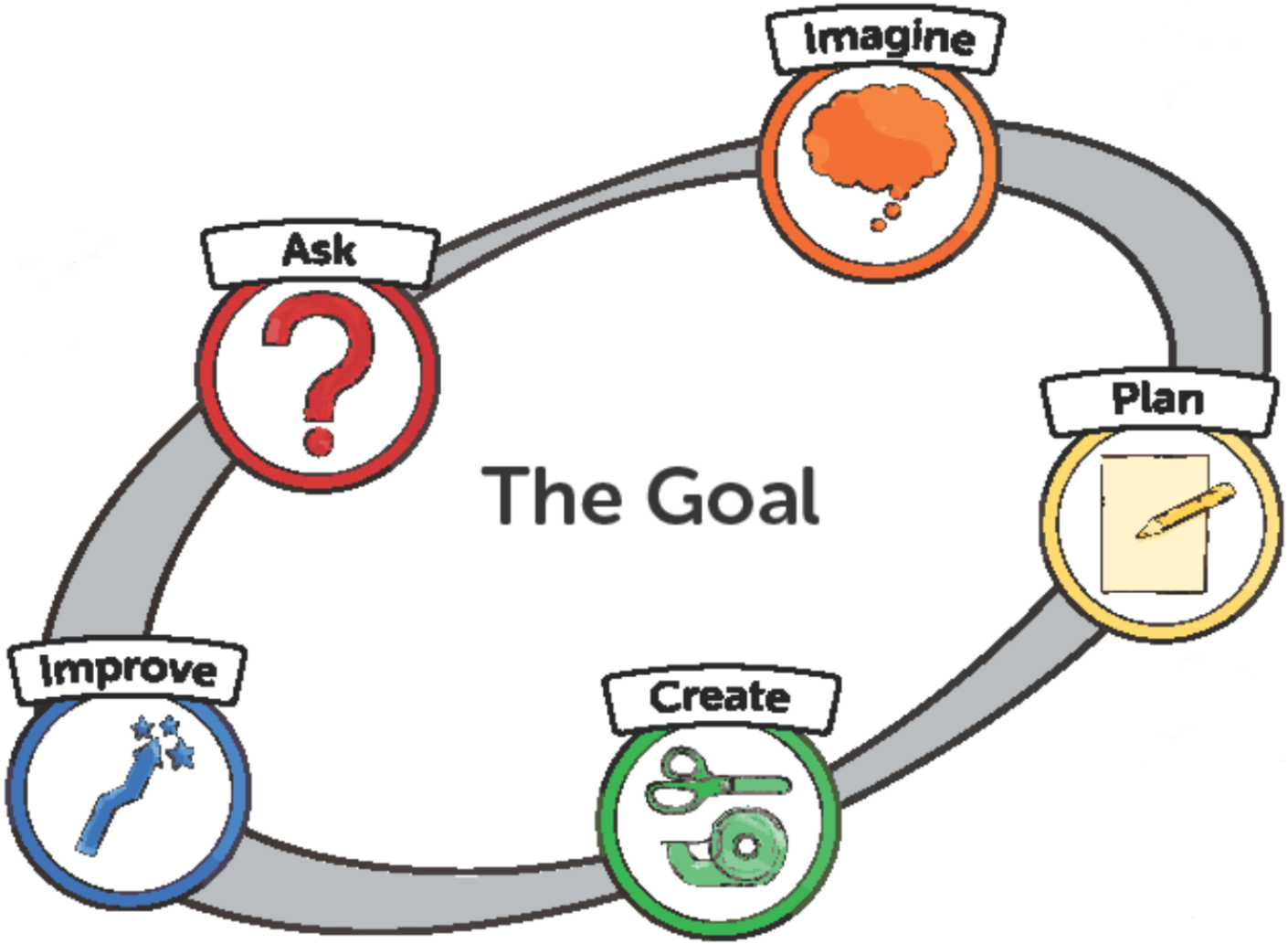
_____

Your Turn!

Engineering Sails

Design Challenge:
Engineer a sail that travels as far down a sail track as possible using limited materials.

Discuss with your group…



Discuss with your group...

What do we already know about _____?

What do we need to know about _____?

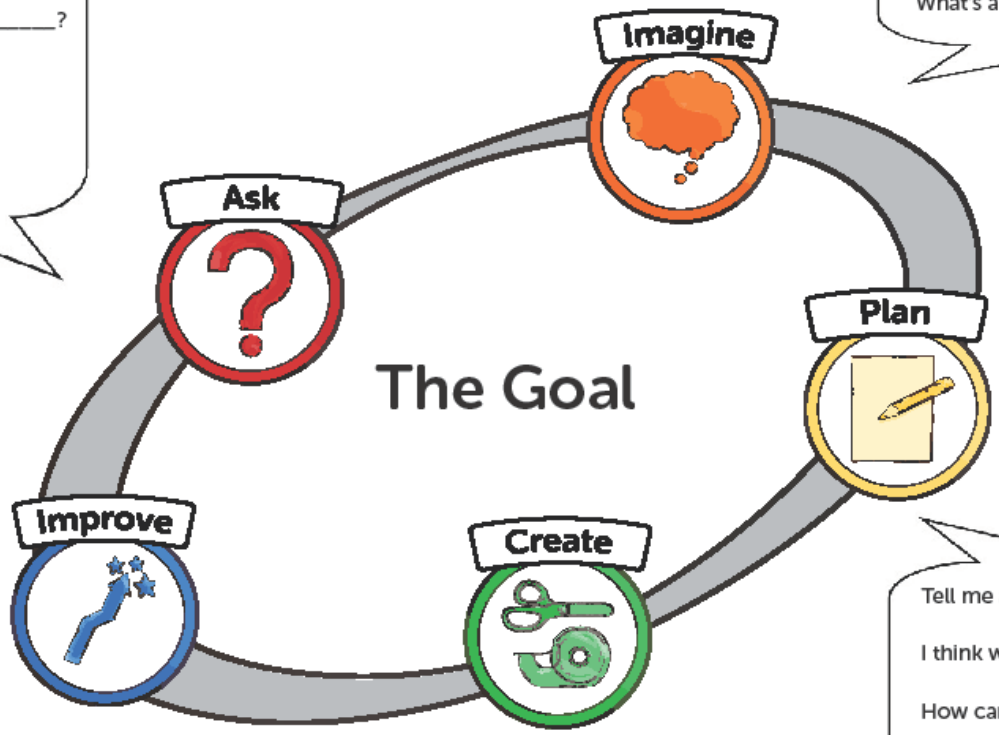
What do you think about _____?

What's something we learned in Lesson 3 that can help?

I wonder if _____.

One idea could be _____.

What's a different way I can solve this problem?



Tell me about the ideas you imagined.

I think we should try _____ because _____.

How can we combine parts of everyone's ideas?

We decided that _____.

Can you help me _____?

How can we test our ideas?

What parts of the design do you like?

Which parts worked well?

I would improve _____ because _____.

How can we change our design so that it works better?

Testing the Materials

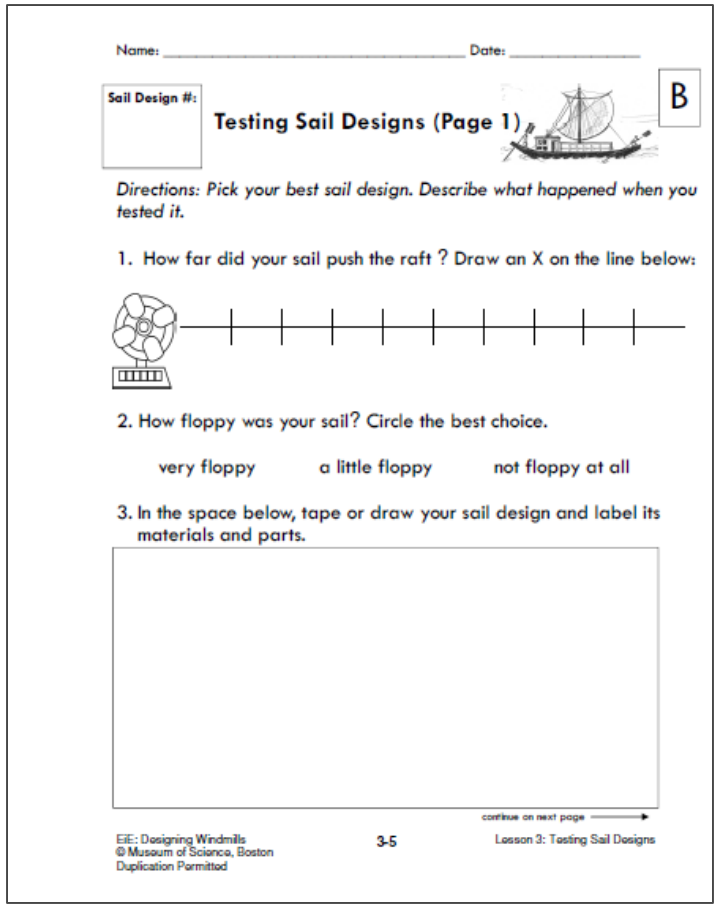
- Work in groups to come up with a plan.
- Build your first sail for testing in **five minutes.**
- Use as many of the sail materials as you would like.
- If you would like to create a frame for your sail, there are straws, extra popsicle sticks and coffee stirrers for that purpose.
- You should build your sail on the **broad side** of the popsicle stick!

Testing Your Sail Designs

1) Measure and record how far your sail designs travels.

2) Draw and label a diagram of your sail design.

3) Attach your sail to our results line plot.



Name: _____ Date: _____

Sail Design #:

Testing Sail Designs (Page 1)

B

Directions: Pick your best sail design. Describe what happened when you tested it.

1. How far did your sail push the raft ? Draw an X on the line below:

2. How floppy was your sail? Circle the best choice.

very floppy a little floppy not floppy at all

3. In the space below, tape or draw your sail design and label its materials and parts.

continue on next page

EiE: Designing Windmills
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Sharing our data

- Place each of your sails above the posted line to indicate how far that design went.

Analyzing our data

- What sort of information does this line plot tell you?
- Which materials seem to be the most effective at catching the wind? Why do you think so?
- How did exploring the materials before designing and observing our line plot influence your design decisions?

Reflection

- What scaffolds or language supports did you notice embedded in this activity?
- Where did you engage in authentic discourse?
- What additional supports might your students need to engage in engineering activities?

Research shows that students' English language acquisition is best supported by:

- Using vocabulary in an authentic context
- Inquiry, problem-based science instruction
- Using "discourse conventions," particularly around arguing from evidence
- Using graphic organizers or infographics
- Having multiple ways to assess learning
- And much more!

Engineering is Elementary

Catching the Wind: Designing Windmills

Lesson 3: Testing Sail Designs

Engineering is Elementary

National Center for Technological Literacy

Museum of Science, Boston

Questions on Your Mind?

Museum of Science

EiE

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