Let's Get Physical With Elementary Physical Science!

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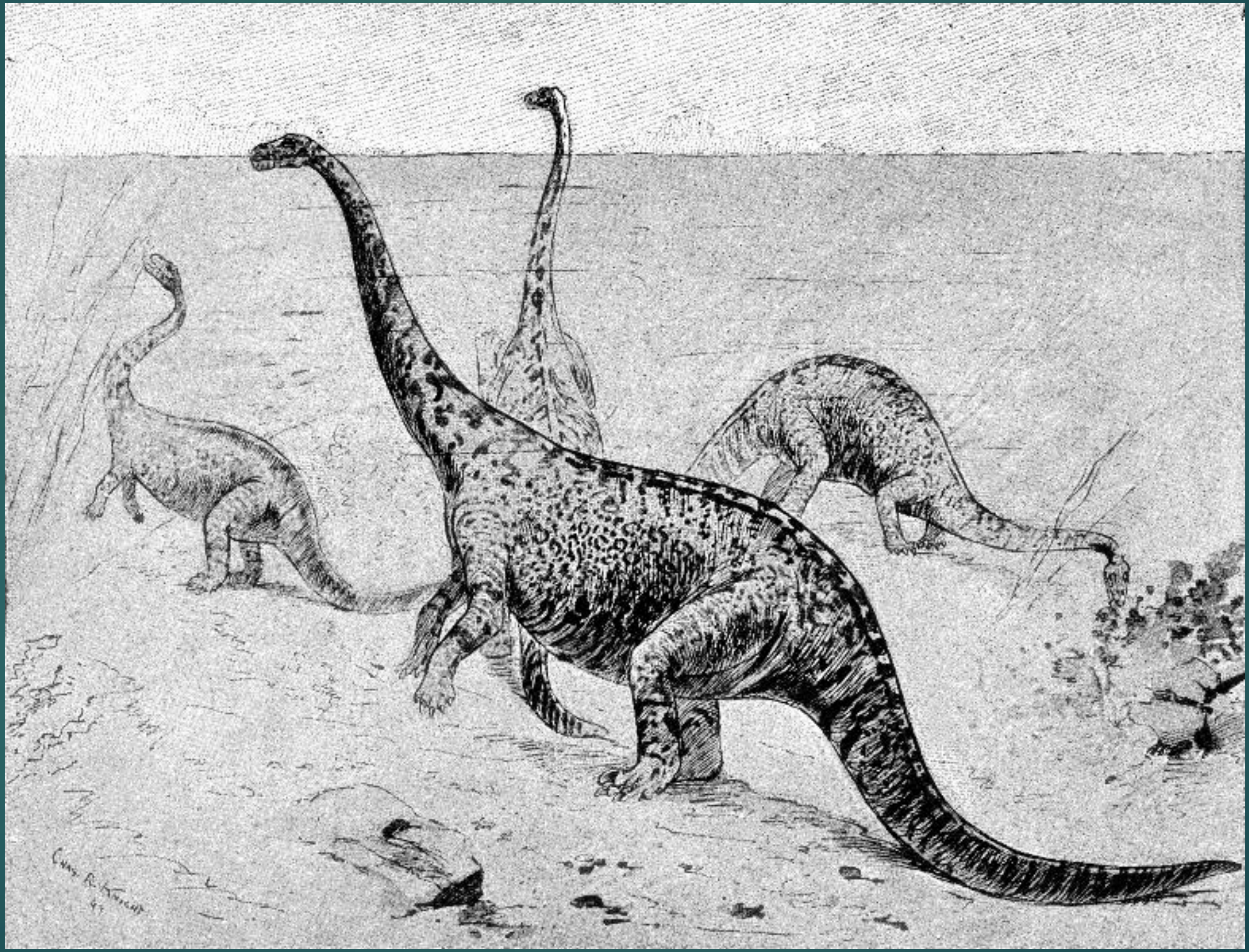
Remember When …

Welcome!

- Goals for Today:
  - Engage in hands-on physical science investigations that promote the engineering design process, incorporate the science and engineering practices, and infuse STEM.
  - Identify strategies and receive resources to facilitate the LSSS Physical Science performance expectations in the elementary classroom.
  - Learn strategies for "stemifying" your mathematics and science lessons.

Past



Present

Let's Take a Closer Look

- Examine the two sets of standards at your table.
- Turn and Talk to a partner and discuss:
  - First impressions
  - What's the same?
  - What's different?

Three-Dimensional Performance Expectations

- Three-dimensional Performance Expectations
  - **Science and Engineering Practices** - detail the behaviors that students should engage in that mimic those of scientists and engineers. The performance expectation integrates the science and engineering practice that is in bold print; however, instruction may integrate any practice.
  - **Disciplinary Core Ideas** - describe the most essential ideas (content) in the major science disciplines. Each disciplinary core idea has a code descriptor made up of letters and a number. The letters represent the domain and the number represents the topic.
  - **Crosscutting Concepts** - are ideas that have applications across all areas of science.

Putting the Practices into Action!

THINK-PAIR-SHARE

- Review the statements on the handout.
- Match each statement to the corresponding Science and Engineering Practice(s).
- Share your findings with a partner.
- Share your findings with your table group.

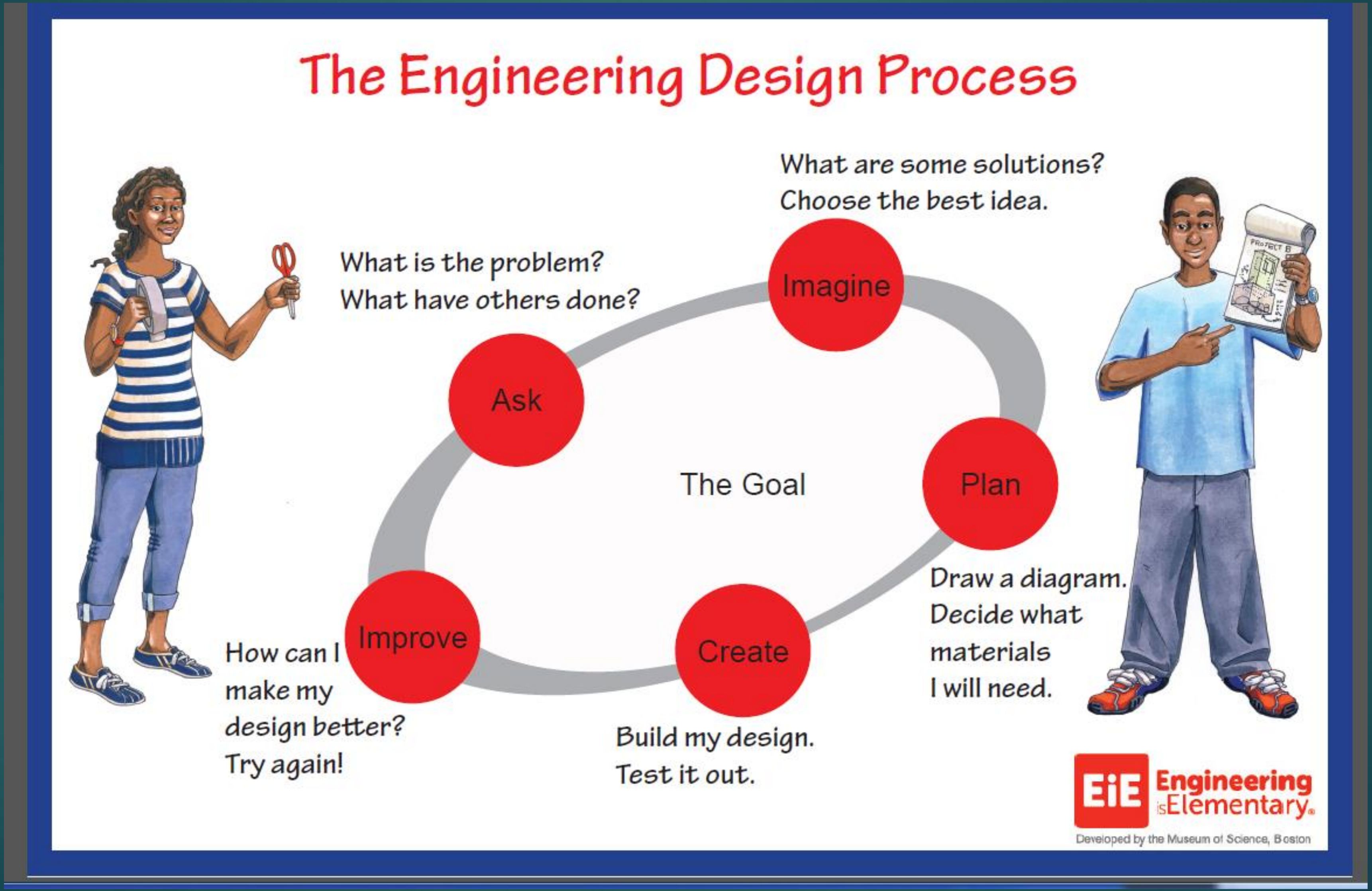
The Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

What do engineers do?

- **Turn and Talk** to a partner and discuss the following question: What do engineers do?

The Engineering Design Process



The Paper Plane Challenge

- Your engineering challenge for today is to design and build a paper airplane that will stay in the air for as long as possible.

What types of engineers work for an airline?

Instructions and Rules

- You will be **working in groups** of 3 or 4.
- You will **all get to make and fly your own plane**.
- Your plane is to be made from a **single 8 ½ x 11 sheet of paper**.
- Your plane is to be **hand-launched**.
- Your plane is to be designed to **stay in the air for as long as possible**. For this activity, distance and speed *are not* as important as length of flight.
- You will **time your flight** using a stopwatch.
- You will have the chance to **redesign** your plane and try again to see if you can **increase** the time it stays in the air.

Materials and Constraints

Materials

- One piece of 8 ½ x 11 sheet of paper.
- Ruler or measuring tape
- Scissors
- Stopwatch or phone with stopwatch.

Constraints

- Your plane is to be made from a **single 8 ½ x 11 sheet of paper** only.
- Your plane is to be **hand-launched**.
- You will **time your flight** using a stopwatch.

Getting Ready

- Imagine your last plane ride. Think of the following:
  - the movement and direction of the plane during take-off, flight and landing
  - the speed of the plane
  - And the shape and features of the plane that enable it to fly.
- Keeping these items in mind, use your memories and experience to sketch a design for your plane. (You may want to include measurements in your design.)

Build and Test Your Plane Design

- Use the designated materials to build your plane.
- Along with the members of your group, you will fly your plane and record the length of the flight.
  - Each group will have the opportunity to fly their planes and record the length of flight.
  - Record your plane's flight time.

Turn and Talk – Making Changes to Your Original Design

- Your original design is the one your group will compare to other designs when you change different **variables**.
- A **variable** is anything you can change that might affect the outcome (how long the paper airplane stays in the air).
- Turn and talk to a partner and discuss something you could change that might affect how long the paper airplane stays in the air.

The Re-design

- Work with your group members to redesign the plane that had the best flight time. Things to consider:
- Four forces associated with flight:
- *Lift* can be affected by wing shape and size.
- *Thrust* is provided by the launch of the plane when released from the hand.
- *Weight* can be changed by adding paperclips to the plane.
- *Drag* can be affected by altering the shape of the wingtips of the plane.
- Test your new plane and record your findings. How is this plane different than the first one?

Think-Pair-Share
Connections to LA Student Standards for Science

Let's reflect on the paper plane challenge. Describe evidence/examples of the 3-dimensions below.

- Science and Engineering Practices
- Cross-Cutting Concepts
- Disciplinary Core Ideas

Putting the Pieces Together

- Science – addressed forces and how they act on objects.
- Technology – generating design ideas that match constraints and communicating design through a three-dimensional representation
- Engineering – The task has an aerodynamics engineering context
- Mathematics – focus on measurement (linear and time) and geometry (location, direction, and transformation of shapes)

Station Time!

- Use this time to complete **at least two** station activities. Answer the following questions for each activity you complete.
  - What big ideas in science/math are addressed by the activity?
  - What science and engineering practices did you observe?
  - How could you modify, extend, and/or differentiate the activity to address varying ability levels, student needs, grade levels, etc?

Let’s Debrief!

Making Connections

- *iSTEM column in the Teaching Children Mathematics* Journal published by the National Council of Teachers of Mathematics (NCTM) www.nctm.org
- The NSTA Learning Center on the National Science Teachers Association (NSTA) website www.nsta.org
- www.Pbskids.org/zoom

Questions

- To obtain an electronic copy of the materials from today's presentation, please fill out the information card (index card) with the following:
  - Your name (first and last)
  - E-mail Address

THANK YOU!

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