Need for the PD

- Materials
  - Trash bags
  - Paper clips
  - String
  - Scissors
  - Tape?
- Printed
  - Exit Ticket
  - Lesson Sketch sheet

What is STEM?

Presenters:
Dr. Joshua Rosenberg and
Michael Lawson

February 20th, 2019
Northview Primary School

THE UNIVERSITY OF
TENNESSEE
KNOXVILLE
BIG ORANGE. BIG IDEAS.®

What is STEM?

- Task: Describe STEM using pictures, sentences, key words, etc.
  - The Challenge: To develop a model of STEM teaching and learning using lines, circles, and text.
- Materials
  - Chart paper
  - markers
- Time: 10 minutes

What is STEM?

- Thinking about STEM as a set of practices (doing and thinking):
  - CCSS Math Practice Standards
  - NGSS Practice Standards

- Thinking about STEM as a tool to understand and identify
    - things that are changing in a situation
    - things that are important
- Cain's Arcade

STEM Related Practice Standards

- NGSS Practice Standards
  - Asking questions and defining problems
  - Developing and using models
  - Planning and carrying out investigations
  - Analyzing and interpreting data
  - Using mathematics and computational thinking
  - Constructing explanations (for science) and designing solutions (for engineering)
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information
- CC Math Practice Standards
  - Make sense of problems and persevere in solving them.
  - Reason abstractly and quantitatively.
  - Construct viable arguments and critique the reasoning of others.
  - Model with mathematics.
  - Use appropriate tools strategically.
  - Attend to precision.
  - Look for and make use of structure.
  - Look for and express regularity in repeated reasoning.

First Steps to Developing Students' Thinking about STEM

- Draw/Write what you think is going on?
  - Why do I smell things from a distance?
  - How does a tractor move?
  - Why does the mirror fog up when you take a hot shower?

- You try:
  - Can you think of one that your students would be interested in? What content does it tie to in your curriculum?

Making decisions about important information in situations

- Graphing Stories
  - http://www.graphingstories.com/
  - Think about…
    - What is happening?
    - What information is important?
    - What is changing?
    - How do we describe what is going on?
- Estimation 180
  - http://www.estimation180.com/

STEM and Literacy

How do STEM and Literacy connect?

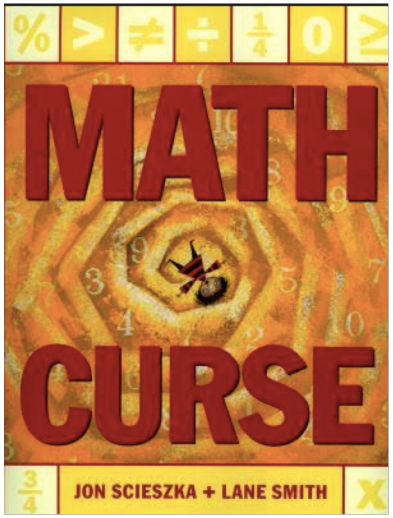
Why use literacy to talk about STEM subjects?

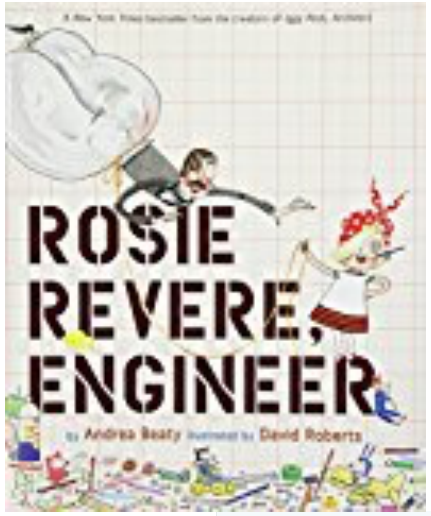
STEM Related Practice Standards

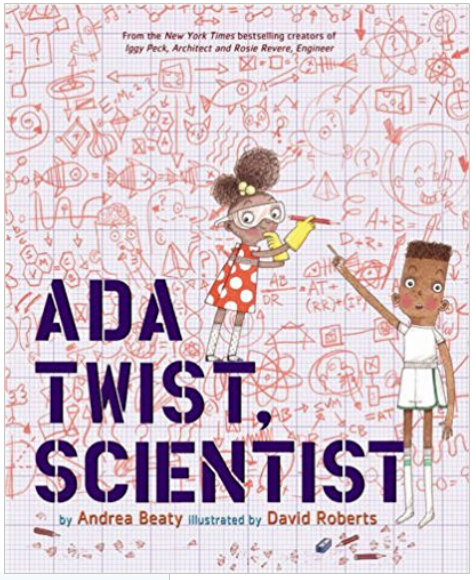
- TN **Literacy** Skills for Math and Science Proficiency
  - Use multiple reading strategies.
  - Understand and use correct mathematical vocabulary.
  - Discuss and articulate mathematical ideas.
  - Write mathematical arguments.

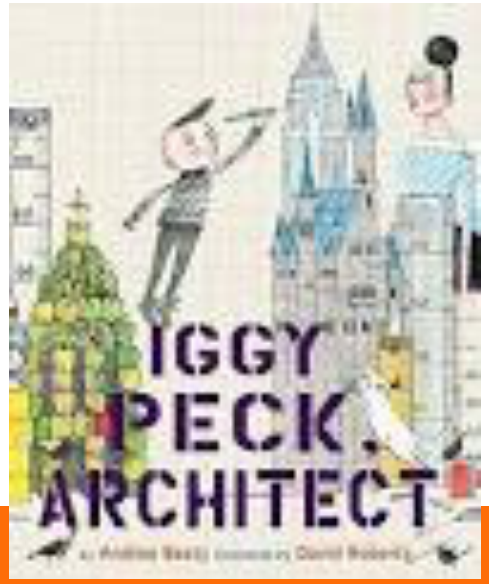
Literacy and STEM

[Ada Twist Scientist]









STEM and Literacy

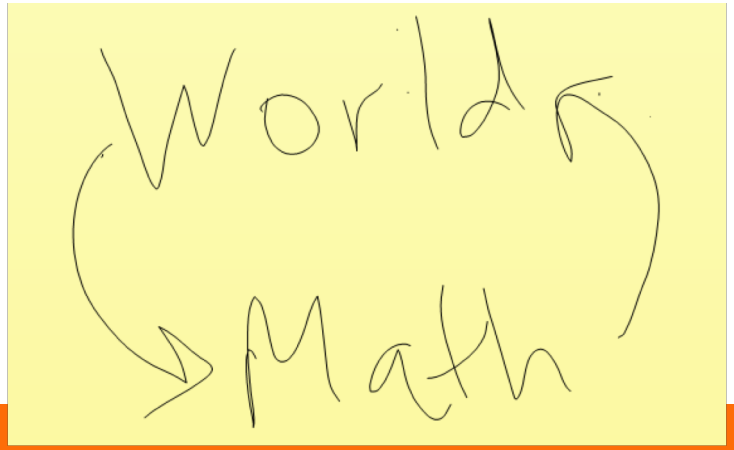
- What did Ada teach us about STEM?

STEM Modeling Activtiy

BIG ORANGE BIG IDEAS

Real-world STEM Modeling

- 1. Identifying essential information in a situation
- 2. Designing ways to figure out that information
- 3. Testing our way of thinking
- 4. Interpreting the results of those operations
- 5. Validating the conclusions of those results



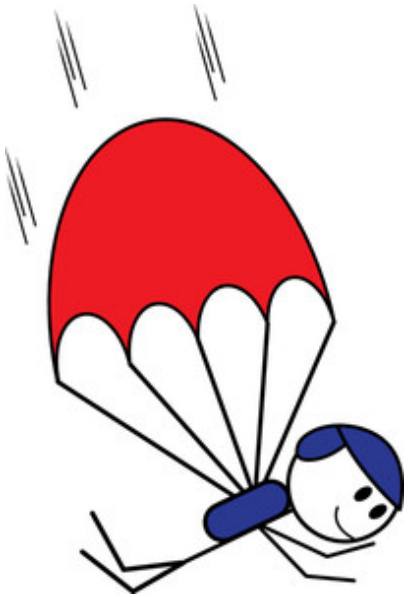
Chutes-R-Us

Chutes-R-Us

You are employees of a new company that designs and makes parachutes. Your job in your design team is to design a parachute that has the lowest terminal velocity when it hits the ground, but is not too expensive to make.

You will be provided with the materials (silk, cord, tape, and scissors). The cost of each parachute is determined by the amount of silk you use. The cost of silk is $1.00 per square centimeter.

This activity is adapted from one created by Paul Hodge and colleagues at Vanderbilt University



Your design group will work during this class to design and build a parachute. Each design group will present their design and test their parachute. We will take this data as a company to determine “the best” parachute.

Good Luck!

How do we define “the best” parachute?

Example of Data Collected

- How did we collect the data? What did we take into consideration? What do we need to add to this data set to make it complete and usable to determine “the best”?

Group	Size (cm^2)	Time in seconds (avg of 3 timers)	Step (*0=floor)
Beast	666	4.36	2
#VolSTEMed	1008	4.59	2
#VolSTEMeme	240	4.62	0
Gucci	1829	5.29	0
I Guess Us	283	2.91	2
Team Without A Name	522	4.31	1
Prototype	711	4.56	0

How could this lesson play out in the elementary classroom?

What are the challenges?

STEM Resources

- Lists of children's literature
  - http://letsreadmath.com/math-and-childrens-literature/middle-school-mathematics-literature/
  - https://www.mathsolutions.com/documents/lessons_chart-2.pdf
  - http://static.nsta.org/pdfs/2018BestSTEMBooks.pdf
- Three-Act-Math: https://gfletchy.com/3-act-lessons/ (among many others)
- 101 Questions: http://www.101qs.com/
- Open Middle: http://www.openmiddle.com/
- NGSS: https://nextgenscience.org/resources/examples-quality-ngss-design
- Concord Consortium: https://learn.concord.org
- STEM Teaching Tools: http://stemteachingtools.org
  Teaching Channel: https://www.teachingchannel.org/home
- NASA: https://www.jpl.nasa.gov/edu/teach/activity/stem-activities-for-families/
- TN Geography: http://data-tga.opendata.arcgis.com/
- Oak Ridge STEM Resource: https://orise.orau.gov/stem/k-12/curriculum-for-the-classroom.html#lesson-plans
- Graphing Stories and Estimation 180

- Who in your school or school system could be a STEM Resource?

STEM Lesson Sketch

Challenge to you!
As you think about STEM in your school and classroom, use the STEM Lesson Sketch to outline what one lesson might involve.

Consider trying 1 or 2 by the end of the year!

But, as Scar would say, “Be prepared!”—for the challenges of doing an integrated STEM lesson and keep at it!

BIG ORANGE BIG IDEAS

Exit Ticket

- On a piece of paper, please respond to the following prompts:

  1) Rate the relevance on the PD to your classroom.

  2) Write **two** takeaways from today's PD.

  3) What do you still want to know about STEM?