

# Culturally Responsive STEM Lesson Plan:



## Humpty Dumpty and your breakfast saved by STEM (Science, Technology, Engineering, Math)

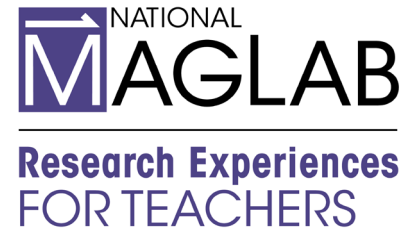
### Lesson Objectives:

- Understand and apply the engineering design process
- Construct an egg protection device that meets the requirements and constraints
- Collect, graph and analyze data to make informed decisions
- Measure the mass/volume of different recycled building materials

### Next Generation Science Standard (Florida):

- ELA.2.R.1.4-Identify rhyme schemes in poems.
- LAFS.3.RL.1.2 Recount stories, including fables, folktales, and myths from diverse cultures; determine the central message, lesson, or moral and explain how it is conveyed through key details in the text.
- ELA.3.R.1.4 - Identify types of poems: free verse, rhymed verse, haiku, and limerick.
- LAFS.5.RL.3.7 Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text (e.g., graphic novel, multimedia presentation of fiction, folktale, myth, poem).
- SC.4.N.1.8 Recognize that science involves creativity in designing experiments.
- SC.4.N.1.3 Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence
- SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.
- SC.4.P.8.1 Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets
- MA.3.DP.1.2 Interpret data with whole-number values represented with tables, scaled pictographs, circle graphs, scaled bar graphs or line plots by solving one- and two-step problems.
- MAFS.7.SP.1.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
- G.K12.4.2.1c Data Analysis - Perform: Use a variety of tools and techniques to organize data to draw conclusive statements.
- G.K12.3.1.1a Cooperative Research - Know: Participate in a cooperative group to solve problems and/or complete a research project.
- G.K12.5.3.2d Communication - Accomplish: Analyze and synthesize the presentation skills necessary to communicate ideas, information, concerns, and solutions to a project goal

# Culturally Responsive STEM Lesson Plan:



## STEM Rationale for Lesson:

An egg drop competition provides the students an exciting opportunity to apply research skills and the engineering design process to solve a real-world problem. Egg breakage and cracking is a major economic loss for egg producers. Broken eggs cannot be sold. Eggs with hair cracks also raise the risk for bacterial contamination and health risks to buyers.

## Culturally responsive connection:

Nursery Rhymes are often considered a common knowledge base for children. Some common rhymes have been repeated from generation to generation, but not all cultures have the same collection. Also, many younger parents have not recited nursery rhymes to their children. Using nursery rhymes to introduce a STEM lesson provides an opportunity to explore earlier eras, raise questions about language, kings, rituals and practices that were described in the rhymes but no longer exist and discuss other societal changes.

The egg drop portion of the lesson provides an opportunity to investigate and understand the both the science of materials and the importance of farming and agriculture as culture.

## Materials Needed:

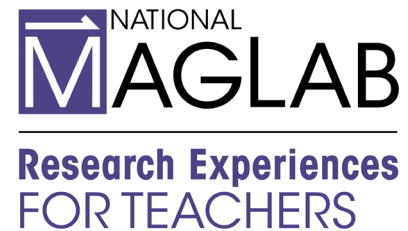
### Provided by Teacher:

- Multiple books that include illustrated version of Humpty Dumpty
  - Mary Engelbreit's *Mother Goose*
  - *Over the Candlestick* by Michel Montgomery
  - The Arnold Lobel book of Mother Goose
  - *And the Dish Ran Away with the Spoon* by Janet Stevens
  - *After the Fall* by Dan Santat
- Computers with internet access
- Measurement tools (rulers, scales)
- Building materials- recycled boxes, newspaper, straws, hay, Styrofoam...
- Eggs
- Access to ladder, stairwell, high point on playground, lift truck or firetruck

## Activate Prior Knowledge:

- Students should know proper use of measurement tools and that science uses metric measurements
- Students should be familiar with the steps of the engineering design process

# Culturally Responsive STEM Lesson Plan:



- Students should have prior experience creating graphs

## Lesson Introduction:

1. Hold up an egg- place in a clear plastic bag and drop it
2. Ask students to explain why it broke, ask for any personal experiences with broken eggs, ask if parents open cartons at the store before buying....

## Lesson Activity:

### Nursery Rhymes

1. Read And the dish ran away with the spoon, by Janet Stevens
2. Ask students if any parts of the book seemed familiar (the story includes many of the characters from nursely rhymes, such as Bo Peep, Jack, Miss Muffet...)
3. Discuss the history of nursely rhymes, the society that the rhymes reflected, the changes that have occurred
4. Ask students to recite any rhymes they know, ask them to talk with their families and share additional rhymes

### Humpty Dumpty

1. Recite the poem without showing any illustrations
  - a. Have the students repeat the poem
  - b. Clap and discuss rhyme scheme (AABB) (ELA.2.R.1.4 - Identify rhyme schemes in poems.)
  - c. Project words to poem (without illustration)
  - d. Watch Brainpop- poems
    - i. Complete activities provided on site that support your class
  - e. Identify type of poem (ELA.3.R.1.4- Identify types of poems: free verse, rhymed verse, haiku, and limerick.)
  - f. Have students illustrate poem in two panels on the wall and after the fall (post and discuss similarities)
  - g. Reread poem- ask where does it say that a humpty dumpty is an egg?
  - h. Discuss history of poem
    - i. <https://www.ripleys.com/weird-news/humpty-dumpty/>
    - ii. <https://www.britannica.com/topic/Humpty-Dumpty>
2. Discuss art and illustrations of poems LAFS.5.RL.3.7
  - i. [https://commons.wikimedia.org/wiki/File:Through\\_the\\_looking\\_glass\\_-\\_and\\_what\\_Alice\\_found\\_there\\_\(1897\)\\_%2814729710906%29.jpg](https://commons.wikimedia.org/wiki/File:Through_the_looking_glass_-_and_what_Alice_found_there_(1897)_%2814729710906%29.jpg) (Lewis Carroll thru the looking glass)

# Culturally Responsive STEM Lesson Plan:



3. Share example of books or image search book with humpty dumpty

## Saving Humpty Dumpty

1. Ask: Are broken eggs a real-world problem?
2. Provide information on egg breakage
  - a. This site provides information about egg production and breakage  
<https://mymarketnews.ams.usda.gov/viewReport/1665>
3. Things to know about eggs
  - a. A video showing a stress test on an egg  
<https://www.youtube.com/watch?v=qcXNKaPP8Jc>

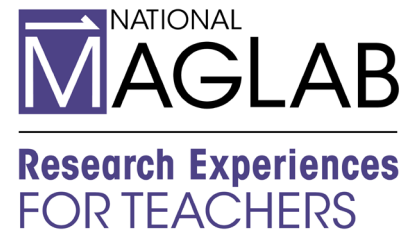
## Introduce Egg Drop Competition

- Video resources (review of valid sources)
  - Good factual video <https://www.youtube.com/watch?v=nsnyl8llfH4>
  - Poor misleading video <https://www.youtube.com/watch?v=nsnyl8llfH4>

## Discuss Rules and Constraints

The rules and constraints can be adapted to your situation, the following are the current rules being used in my classroom

# Culturally Responsive STEM Lesson Plan:



## EGGS AWAY

### ANNUAL STEM DESIGN CHALLENGE

- **STEM Mission:** Design and build an Egg Protection Device (EPD) that will prevent an uncooked egg from breaking when dropped from two (2) successive heights.
- **CONSTRUCTION SPECIFICATIONS** -All egg crates must meet the following specifications:
- **MATERIALS**
  - **A.** Parachutes, balloons, helium balloons, propellers (of any type) or inflatable material (i.e. inflatable foam, bubble wrap), liquids, oils, food items of any kind are **NOT** permitted. No glass or shattering materials.
  - **B.** Eggs will be supplied (Large chicken eggs)
- **CONSTRUCTION**
  - **A.** The maximum dimensions of the crates shall be 8" x 8" x 8".
  - **B.** The entire egg crate must be able to pass through a square aperture of 8 inches by 8 inches (8" x 8") in all three axes to be eligible for competition.
- **TESTING AND JUDGING**
  - **A.** Each egg crate will be measured and drop tested from two (2) successive heights.
  - **B.** Material may not differ after the first drop; only one crate may be used for both drops.
    - **Only one entry per individual or group**
- Provide timeline for project
- Provide design and building time
- Provide opportunity for three iterations and data collection before final contest
- Individual/Group presentations of data and material choices
- Egg drop competition and celebration

**Lesson by:** Jollyn Nolan