Sturdy Structures

- **Science**: Experiment with different shapes and structures to determine the most stable design for a wall.
- **Technology**: Use virtual simulations to test the impact force on various wall configurations.
- **Engineering**: Construct a wall using recycled materials to protect Humpty Dumpty.
- **Art**: Decorate the wall with colorful patterns or illustrations related to the nursery rhyme.
- **Math**: Calculate the angles and stability of the wall to prevent Humpty Dumpty from falling.

Objective(s)

- How can you build a wall for Humpty Dumpty?
- How can you build a wall that Humpty Dumpty can sit on safely without falling off?

Activity that involves problem-solving and strategic thinking:

- Students will use a variety of materials to build a sturdy wall.
- Students will compare materials used to build a sturdy wall.

Standards/Objectives addressed:

NGSS:

- K-PS2-1: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

CCSS:

- K.G.A.2: Correctly name shapes regardless of their orientations or overall size.
- K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

Background knowledge needed:

Basic Geometry:

- Understanding of shapes, angles, and spatial orientation to design and construct the wall effectively.

Materials and Structures:

- Familiarity with different materials (such as cardboard, popsicle sticks, clay) and their properties to choose suitable building materials for the wall.

Engineering Concepts:

- Knowledge of basic engineering principles like stability, weight distribution, and structural integrity to ensure the wall can support Humpty Dumpty without collapsing.

Scientific Inquiry:

- Ability to plan and conduct simple investigations to test the strength and durability of different wall designs.

Creativity and Problem-Solving Skills:

- Capacity to think creatively, innovate, and troubleshoot potential challenges that may arise during the construction process.

Materials:

- Recycled materials: Cardboard, tubes, small boxes, egg cartons, cups, bottles, etc.
- Popsicle sticks or craft sticks
- Adhesive materials: tape, glue, glue dots, clay
- Scissors
- Markers or paint:
- Ruler

Prompts – questions or statements to elicit engagement

- What shapes can we use to make our wall strong and stable?
- How can we ensure that our wall is tall enough to protect Humpty Dumpty?
- What materials do you think will be the best choice for building a sturdy wall?
- How can we test the strength of our wall before placing Humpty Dumpty on it?
- What improvements or additions could we make to our wall design to enhance its stability?
- Why is it important to consider the angle and positioning of our wall in relation to Humpty Dumpty?
- How can we decorate our wall to make it more visually appealing while still keeping it strong?
- What other nursery rhyme characters might benefit from a similar sturdy wall? How would you design it for them?

Vocabulary

- **Stability**: The ability of a structure to maintain its position and resist forces that may cause it to tip or fall.
- **Structural Integrity**: The strength and stability of a structure as a result of its design and materials.
- **Foundation**: The base or support on which a structure is built to ensure stability.
- **Reinforcement**: Adding additional materials or supports to increase the strength and durability of a structure.
- **Design**: The plan or layout for how a structure will be constructed, including shape, size, and materials.
- **Angle**: The space or bend between two intersecting lines or surfaces, important for stability and weight distribution.
- **Support**: Materials or structures that hold up or brace the main components of a wall.

- **Load**: The weight or force applied to a structure, such as the pressure Humpty Dumpty exerts on the wall.
- **Collapse**: To fall down or break apart due to weakness or instability.
- **Decoration**: Adding artistic elements or embellishments to enhance the appearance of the wall.

Reflection prompts

- What challenges did you encounter while building the wall, and how did you overcome them?
- How did your understanding of shapes and structures help you design a sturdy wall for Humpty Dumpty?
- What was the most important factor in ensuring the stability of your wall?
- Did your initial design plan evolve as you started building the wall? If so, how and why?
- How did you decide on the materials to use for the wall, and do you think they were good choices?
- What aspects of the construction process did you enjoy the most, and why?
- If you were to rebuild the wall, what improvements or changes would you make based on what you learned?
- How did working as a team contribute to the success of your wall-building project?
- What connections can you make between building the wall for Humpty Dumpty and real-world engineering and construction projects?