Flying Lego Engineers: Mastering the Zipline Mission

Grade Levels: Kindergarten to Fifth Grade

Subject: STEM (Science, Technology, Engineering, Mathematics)

Duration: 1 hour

Objectives:

- Students will apply the Engineering Design Process to design and build a Lego contraption that can glide down a zipline.
- Students will demonstrate creativity, critical thinking, and problem-solving skills.
- Students will explore concepts of stability, weight distribution, and motion.

Standards:

- Next Generation Science Standards (NGSS):
    - NGSS.K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
    - NGSS.3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Common Core State Standards (CCSS):
    - CCSS.MATH.CONTENT.K.G.A.2: Correctly name shapes regardless of their orientations or overall size.
    - CCSS.MATH.CONTENT.2.MD.A.1: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

Lesson Plan:

Introduction (10 minutes):

- Begin by discussing the concept of engineering and its importance in solving problems and creating solutions.

- Introduce the Engineering Design Process (Ask, Imagine, Plan, Create, Improve) and explain that students will be using this process to complete a Lego Zipline Contraption Challenge.
- Show students the zipline setup and explain the challenge: to design and build a Lego contraption that can glide down the zipline smoothly.

Tier 1: Basic Challenge (Kinder-2nd Grade) - Planning and Building (20 minutes):

- Divide students into small groups.
- Instruct students to brainstorm ideas and sketch their designs for a simple Lego contraption that can glide down the zipline.
- Provide students with a variety of Lego bricks and materials.
- Allow students time to build their contraptions based on their designs, encouraging them to test and adjust as needed.

Tier 2: Intermediate Challenge (3rd-5th Grade) - Adding Lego People (20 minutes):

- After completing the basic challenge, explain the intermediate challenge: to modify their contraptions to hold Lego people as passengers.
- Emphasize that the Lego people must be dropped inside the contraption at the starting point, not snapped on.
- Encourage students to consider weight distribution and securement within their contraptions as they design and build.
- Allow students time to modify their contraptions and test them with the added challenge of Lego passengers.

Testing and Improvement (10 minutes):

- Have students test their contraptions on the zipline.
- Encourage them to observe how their contraptions perform and identify areas for improvement.
- Discuss the results as a class, highlighting successful designs and potential modifications.
- Emphasize the importance of the "Improve" step in the Engineering Design Process and encourage students to continue refining their contraptions if time allows.

Conclusion (10 minutes):

- Review the Engineering Design Process and the key concepts learned during the activity.
- Congratulate students on their creativity and problem-solving skills.
- Discuss how engineers constantly iterate and improve their designs based on testing and feedback.
- Encourage students to apply what they've learned in future STEM challenges and real-world problem-solving scenarios.