From Rome to Home: Constructing Aqueduct Models

Grade Levels: 2nd and 3rd Grade

Subject: STEM - Environmental Engineering

Duration: Roughly 1hour

Standards:

- NGSS 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 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.

Objectives:

- Students will understand the historical significance and purpose of Roman aqueducts.
- Students will apply the engineering design process to construct a model aqueduct that efficiently transports water.
- Students will analyze the effectiveness of their designs in terms of stability and water flow.

Materials:

- Paper towel tubes
- Aluminum foil
- Keva planks
- Plastic cups (cut to 1 or 2 inches tall)
- Water
- Measuring cups
- Trays to catch water

Procedure:

1. Introduction (10 minutes): Discuss the history of Roman aqueducts, explaining why they were developed—to transport water to urban centers for drinking, bathing, and irrigation. Highlight how these structures helped the Romans manage environmental resources sustainably.
2. Design Phase (5 minutes): Students sketch their aqueduct designs, planning how to use materials to create a structure that can transport water effectively. They consider how to make their aqueduct stable and efficient.
3. Construction Phase (15/20 minutes): In groups, students build their aqueduct models using paper towel tubes lined with foil and supported by Keva planks. They place the plastic cups at the end to collect the water.
4. Testing Phase (10 minutes): Pour water into the aqueducts to see if it can travel from the start to the end without spilling. Students observe and note any issues with flow or stability.
5. Discussion and Optimization (10 minutes): Discuss what worked and what didn't. Students suggest improvements to their designs based on their observations.
6. Conclusion (10 minutes): Recap what was learned about Roman engineering and environmental engineering principles. Discuss the importance of designing systems that efficiently use and conserve resources.

Assessment:

- Evaluate students on their ability to work within a team, follow the design process, and effectively communicate their findings.
- Assess the functionality of each aqueduct model in terms of stability and water transportation.

Extension Activity:

- Research and Presentation: Students can research modern uses of aqueducts around the world or investigate local water transportation systems. They could prepare a short presentation or poster sharing their findings with the class.
- Creative Writing: Students write a short story or diary entry from the perspective of a Roman engineer designing an aqueduct, discussing the challenges and successes they might have encountered.