River Crossings: A Civil Engineering Adventure for Kids

Grade Levels: Kindergarten through 3rd Grade

Subject: STEM - Civil Engineering

Duration: 1-1.5 hours

Standards:

- Next Generation Science Standards (NGSS):
    - K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
    - 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 basic roles and responsibilities of civil engineers, particularly in bridge construction.
- Students will explore structural engineering concepts by building, dismantling, and rebuilding beam bridges using different materials.
- Students will develop problem-solving skills and teamwork through hands-on creative play, enhancing their understanding of how different materials affect construction and stability.

Materials:

- Blue butcher paper (to represent the river)
- Building stations:
    - Keva Planks
    - Magnetic tiles
    - Brainflakes
    - Legos
- Measuring tape or rulers
- Engineering worksheets (to draw plans and record observations)

Procedure:

1. Introduction (15 minutes):
    - Introduce civil engineering, focusing on its importance in building bridges.
    - Explain the session's objective: students will build bridges at various stations, using different materials to understand material properties and engineering challenges.
2. Building Phase (45 minutes):
    - Divide students into small groups and assign each group to a building station.
    - Students will build a beam bridge across the "river."
    - After completing a bridge, students will document their structure on the worksheet, then dismantle it before rotating to the next station.
    - Continue rotating until each group has visited all building stations.
3. Discussion (15-20 minutes):
    - Gather students to discuss their experiences at each station.
    - Ask questions about how different materials affected the bridge's strength and stability.
    - Encourage students to think about which material they found easiest to work with and why.
4. Conclusion (5-10 minutes):
    - Recap the day's activities and reinforce the key concepts learned about civil engineering and materials science.
    - Allow students to express what they found most interesting or challenging.

Assessment:

- Informal assessment through observation during the building and discussion phases.
- Review students' worksheets to assess their understanding and ability to articulate the differences in materials used.

Extension Activity (Optional):

- **Design Challenge:** Have students use their newfound knowledge to design a bridge that could be built in their own community. They can select their preferred materials and explain their choice based on the properties they learned about during the rotations.

- **Science Connection:** Explore the science of materials further by experimenting with how much weight each type of bridge can hold before collapsing. Record results and discuss why some materials can bear more weight than others.
- **Creative Play:** Encourage students to use their favorite building material from the lesson to create a model of an iconic bridge from around the world, fostering both creativity and research skills.