Old Mill Elementary – STEAM Lab – Cox
Grade Levels: Primary (K-2) **Rotation A – 11/16-20 – GENTRY**

Overview
Civil Engineering: Designing Bridges
Target Grade Levels: Primary (K-2)
Big Ideas: A force is a push or a pull. When all forces acting on a structure are balanced, the structure is in a state of static equilibrium.
Unit Summary: This unit guides students to discover and discuss the connections between the science topics of force, balance and stability; the design of bridges; and the field of civil engineering.
Essential Questions: How do civil engineers build stable structures? How can the Engineering Design Process help us solve problems?
Standards Addressed
Next Generation Science: 4-PS3-1. – Use evidence to construct an explanation relating the speed of an object to the energy of that object. 4-PS3-3. – Ask questions and predict outcomes about the changes in energy that occur when objects collide. **Technology/21st Century Skills:** Creativity and Innovation, Critical Thinking, Problem Solving and Decision Making **Engineering:** 3-5-ETS1-1. – Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost. 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. 3-5-ETS1-3. – Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. **Arts:** AH-I-SA-U-2 – Understand the principles of design and the elements of visual arts. AH-I-SA-U-4 – Understand that existing and emerging technologies can inspire new applications of structural components. **Math:** CCSS.Math.Practice.MP2 – Reason abstractly and quantitatively. CCSS.Math.Practice.MP4 – Model with mathematics. CCSS.Math.Practice.MP5 – Use appropriate tools strategically. 3-5.0A – Operations and Algebraic Thinking

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**Accommodations/Modifications – for student specific accommodations, see *Confidential Folder* in wall tray.

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Learning Targets	Learning Activities/Instructional Strategies	Evaluation/Assessment
I CAN… …identify engineers as the people who design objects. …describe the role of civil engineers in identifying and addressing forces acting on a structure. …design, build and tests a bridge. **Critical Vocabulary** Force Push Pull Static Equilibrium/Balance Arch Beam Abutment Failure **Accommodations/Modifications**** Technology Visual Timer Redirection Corrective Feedback Preferential Seating Model targeted skills/direction Structured transition w/advanced warning Frequent and positive feedback	**Daily Structure:** STEAM Townhall (5 minutes, whole group, direct instruction) Center Work (40 minutes, independent, small group practice) Reflection (5 minutes, whole group, independent reflection) **Contact Hour 1 – Preparatory Lesson:** • Examine everyday examples of technology **Contact Hour 2 – <u>Javier Builds a Bridge</u>:** • Read the story Javier Builds a Bridge • Learn about various types of bridges • Talk about what civil engineers do for their jobs • Become familiar with the Engineering Design Process **Contact Hour 3 – Pushes and Pulls:** • Examine several different structures and observe how each is affected by a force • Brainstorm and implement some engineering solutions to prevent forces from a causing a structure to fail • Discuss how civil engineers work to counteract the forces (pushes and pulls) on a structure in order to make it stronger and more stable **Mrs. Gentry's Class should complete bridges this week:** **Contact Hour 4 & 5 – Bridging Understanding:** • Create three different types of bridges (beam, arch, and deep beam) out of index cards • Test each type of bridge to see how much weight it can support and how adding weight affects the structure of the bridge • Examine the materials available for designing bridges and brainstorm how the materials might be used **Contact Hour 6 & 7 – Designing a Bridge:** Use the Engineering Design Process to design a bridge made from paper and other materials Test and improve bridges using the evaluation criteria of strength and stability	• Anecdotal notes • Teacher observation • Discovery Journal • Daily Student Reflections • Self-Assessment • Day 2-5 DIY Projects • DIY Products **Questioning Examples** How have today's experiences inspired me? What was my biggest success today? What was my biggest failure today? How would I reteach what I learned? How is what I created… …beautiful? …thoughtful? …personally meaningful? …sophisticated? …shareable? …moving? …enduring? How could you create a bridge to withstand the forces of an earthquake?

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	NO HOMEWORK – students may continue to explore www.diy.org at home, but are discouraged from creating a personal account as it will not count towards STEAM credit.	

Teacher Reflection/Notes

Higher Order Thinking	Scaffolding	21st C. Skills	Learning Styles	Student Reflection	Project-based
Student Choice	Global Perspective	Interdisciplinary	Student-Centered	Critical Thinking	Differentiation

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