Bridge Construction Curriculum for K-12 students (Resource Exchange)

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Bridge Construction Curriculum for K-12 students

ASEE 2024 – PCEE Division
Dr. Sarah Orton – Univ. of Missouri | Chris Donaldson – Parkway West | Crystal Davis – Excel Business Concepts

Purpose:

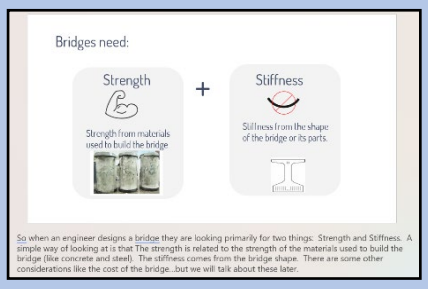
Positively impact students' attitudes toward STEM concepts, classes, and career choices

STEM Solution for the Classroom:

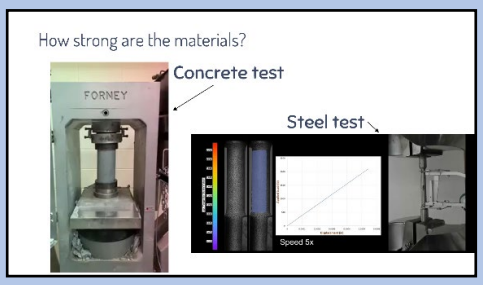
13 independent lessons and activities on bridge design and construction using photos and interviews from a current construction of the new I-70 bridge over the Missouri River

Each lesson includes:

PowerPoint Slide decks



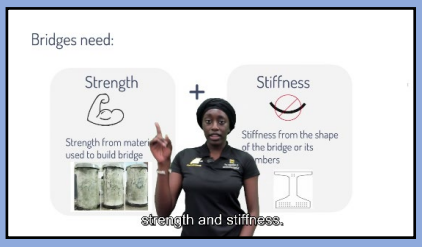
Animated slides with notes that gives theory, background, and examples

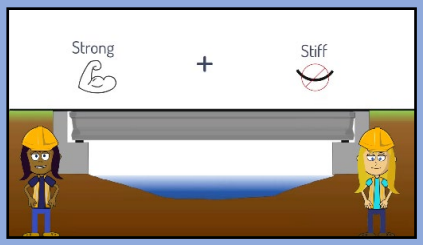


Embedded videos to explain concepts

Interviews with real engineers and photos from an active construction site

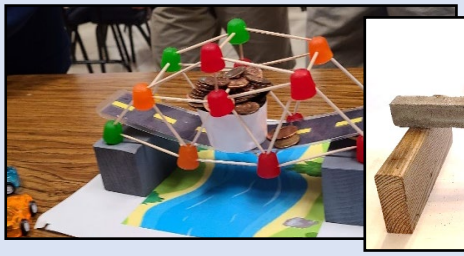
Recorded Videos of presentations

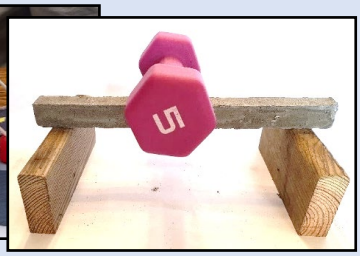




~20 min. animated and on-screen recordings of presentations with captions for student accommodations

Hands-on Activities





Interactive activities to reinforce concepts easily implemented with everyday materials and teacher notes to guide activity

Experience it for FREE at: https://www.modot.org/rocheport/stem

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LUNDA CONSTRUCTION

Bridge Construction Curriculum
Lessons by Grade Level

Elementary (3rd - 5th Grade)

How Bridges Work
Introduces how bridges support load, types, and bridge design; Activity: Gumdrop and toothpick bridge competition

How Concrete Sets
Introduces what makes up concrete, how it sets, and how it is placed; Activity: Making concrete art

How Bridges Are Constructed
Discusses who builds a bridge and how the I-70 bridge was built

Middle and High School (6th Grade - 12th Grade)

How Bridges Work
Discusses how bridges support load, bridge types and bridge design; Activity: Soda straw bridge competition

Bridge Terminology and Design
Describes the different parts of a bridge and what types of failures can happen; Activity: Gusset plate bridge failure

How Bridges Are Constructed
Discusses who builds a bridge, the construction process, and challenges of the I-70 bridge

High School (9th Grade -12th Grade)

How Bridges Work
Covers how calculus and physics help us design a bridge and bridge types; Activity: Design a bridge on a computer

Concrete Mix Design & Hydration
Details how to design a concrete mix and the hydration reaction; Activity: Design and test a concrete mix

Geometric Design of Roads
Introduces geometric design and how it helps you determine where a road goes; Activity: Layout curves in a road

River Hydraulics and Scour
Discusses river morphology and how scour affects bridges; Activity: Build a stream table and evaluate scour

Steel Plate Girders
Covers how steel plate girders are designed and resist loads; Activity: Build and test a paper plate girder

Bridge Foundations
Discusses how soil is classified and foundations designed for bridges; Activity: Evaluate soil strength for test structures

Bridge Expansion Joints
Shows how thermal movements in a bridge occur and are accommodated with expansion joints; Activity: Evaluate differential thermal expansion

Lessons also include:

- Teacher Notes: 1) How to prepare and present lesson, 2) Time required to complete lesson, and 3) Questions to ask and inquiry-based learning options
- Standards alignment to *Common Core State Standards* and Next Generation Science Standards (e.g. Engineering design, literacy, mathematics)

COMMON CORE STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Scan for Educational Standards Alignment

Questions? Contact Dr. Sarah Orton at ortons@missouri.edu