



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
2006 Volume IV: Math in the Beauty and Realization of Architecture

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## **The Math in the Design and Building of Bridges**

Guide for Curriculum Unit 06.04.06  
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What would our world be like without bridges? There are over half a million bridges in our country alone. Do you know how they work? Why are some curved while others are not? Some are delicate, ingenious and innovative while others are sturdy, functional and dull. Each is the result of centuries of creative design, constant technological development and of imagination held in check by the need for safety, reliability and peer approval. Every bridge grows out of people's needs. The story of bridges is a story of materials. Engineers must consider many things before determining the size, shape and overall look of a bridge. The next time you see a bridge after completing this unit, you will see it with a fresh sense of understanding and a greater level of appreciation of all that went into its construction. Engineering is an art as well as a science.

These lessons will enable the students to learn the history of bridges, identify the basic types of bridges, understand bridge vocabulary, determine the most appropriate type bridge for a specific area based on factors like cost, climate, and function, research. Then students will apply information on the Internet, understand the construction, explain the forces of compression and tension, use model software to discover the physics in bridge building, create scale drawings, measure and compute math problems accurately, build a model bridge to test load bearing and design a community bridge that will inspire hope and friendship.

This unit is written for grades eight and up, average math students. The students in New Haven are from a wide variety of backgrounds. Their mathematical skills are often below grade level and their interest in school and math is often low. There is a pressing need to improve academic performance, proficiency on the CAPT test, and high school completion rates. The development and use of a curriculum that focuses on the application of math and problem solving on real life problems in the building of bridges should help inspire and motivate learning.

The unit will begin with the history of bridges, discuss some famous bridges, disasters and bridge facts, explain the basic types of bridges, bridge parts, explore the basic forces at work, truss designs, research and experience the multitude of designs, materials and constructions, find and graph information on bridges, and draw a blueprint. It will conclude with the students designing a bridge for their community that will bridge diversity and promote understanding and community.

(Developed for Algebra I, grades 9-12; recommended for Pre-Algebra, grades 7-8, and Algebra I, grades 7-12)

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