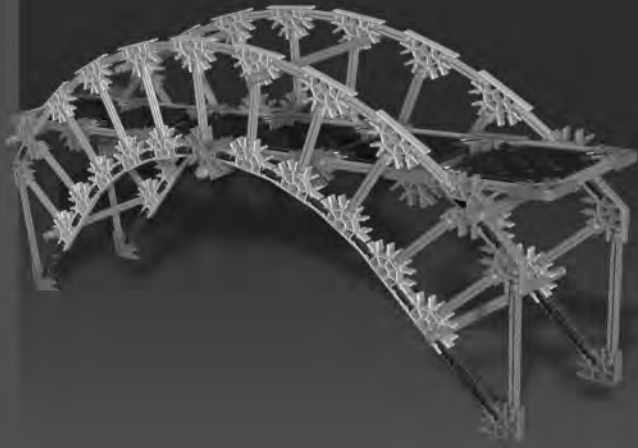


KNEX®

Education

TEACHER'S GUIDE™

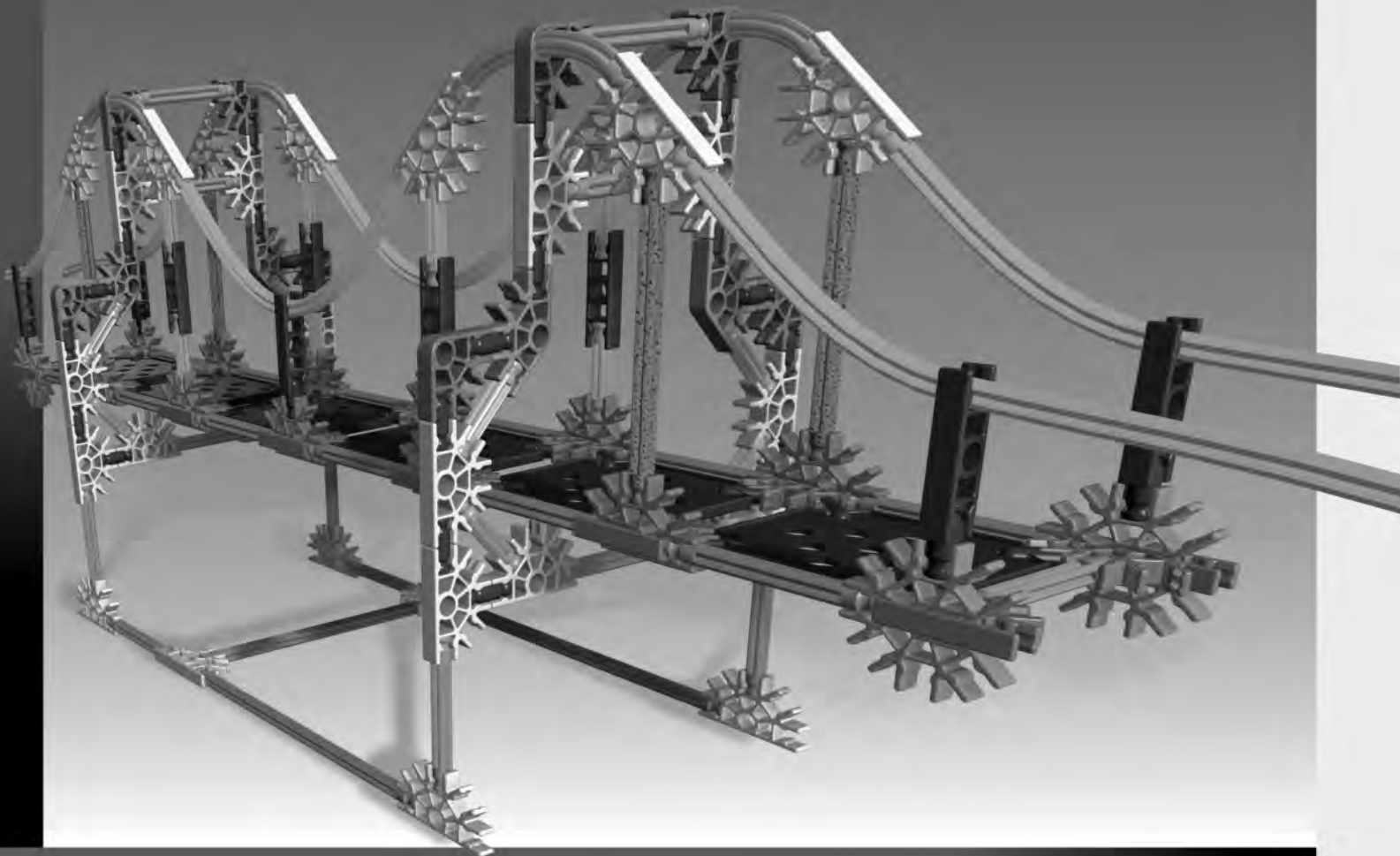
BRIDGES™ INTRODUCTION TO STRUCTURES



ARCH



SUSPENSION



Introduction:

OVERVIEW

This Teacher's Guide has been developed to support you as your students investigate the K'NEX Introduction to Structures: Bridges set. In conjunction with the K'NEX materials and individual student journals that we suggest your students maintain throughout their investigations, the information and resources included here can be used to build your students' understanding of scientific, technical and design concepts and to channel their inquiries into active and meaningful learning experiences.

K'NEX INTRO TO STRUCTURES: Bridges

This K'NEX construction set is designed to introduce students to the history, function, structural design, geometry and strength of bridges. An investigation of bridges helps students develop a good general understanding of the forces involved in structures. They will also gain knowledge of the physical properties of materials and their application in the design and construction of bridges. They will discover that bridge construction, although based on simple scientific concepts, often requires complex engineering solutions. As students use this K'NEX set, they will have the opportunity to acquire skills using a hands-on, inquiry-based approach to information and concepts. Working cooperatively, they are encouraged to interact with each other as they build, investigate, problem solve, discuss, and evaluate scientific and design principles in action.

TEACHER'S GUIDE

Designed as a resource for the teacher, this guide provides background information on the main types of bridges commonly found today, the materials used in their construction, and the engineering principles that have been applied to allow them to support loads. It identifies student objectives for each unit, and offers plans and scripts to successfully present each bridge model and its associated activities. A glossary of key terms and definitions associated with bridges is also included. Most of the units can be completed in 30-45 minutes. There are also extension activities and a selection of worksheets that can be used to explore the concepts more deeply. We recommend that teachers review their curriculum and state standards to identify which of the activities provided in this guide best meet their needs.

STUDENT JOURNALS

It is expected that student will always have journals available for recording information. They should be encouraged to enter initial thoughts at the start of an inquiry – what they “think” will happen. These initial thoughts may be amended, based on their ongoing inquiry and analysis, until the students feel comfortable about drawing conclusions. Their journal entries will help make a connection between the models they have built, the experiments they have conducted, and how this information is applied to the real-world bridges they use or see on a regular basis. The journals will also provide students with a place to practice making drawings and diagrams of structures. Finally, the journals will serve as a method of assessment for the Bridges unit. Journal Checklists are also included in the Teacher's Guide for each of the models and their associated inquiry activities.

TABLE OF CONTENTS

Objectives	3
Key Terms and Definitions	3
Key Concepts	5
Introduction to Bridges: Preparatory activities (Optional)	19
Introduction to Bridges: What do bridges do?	21
Are All Bridges the Same? How bridges support their loads	25
The Beam Bridge	29
The Truss Bridge	35
The Cantilever Bridge	41
The Bascule Bridge	49
The Arch Bridge	55
The Suspension Bridge	61
The Cable-Stayed Bridge	71
Designing a Bridge: Time and cost factors	77
Worksheets	81