NEW YORK TRANSIT MUSEUM

Workshop: Bridges of NYC

Aerial View, 1928. Eleanor Rapsis Collection, New York Transit Museum.

New York City has many bridges made using different methods of **construction**. Bridges help connect different parts of our city that are separated by water. You can travel over some bridges by train, car, foot, or bike! We can use the **scientific method** to design our very own bridges that can support real weight.

Can you name any NYC bridges?

Let's look at some different kinds of bridges we can find in New York City.

Brooklyn Bridge, Early 20th Century. Eleanor Rapsis Collection, New York Transit Museum.

LOOK

Take a moment to look closely at all of the details in this picture. What do you notice?

THINK and SHARE

- Have you seen this bridge before? Perhaps you've crossed it before—on a bus, in a car or even on foot.
- What adjectives, or descriptive words, might you use to describe this bridge?
- What shapes can you find in this bridge?

DISCOVER

This is the Brooklyn Bridge, a **suspension bridge** that connects Manhattan and Brooklyn. It was the world's first steel-wire suspension bridge, and it took 14 years to build. It opened in 1883. Horse-drawn vehicles and elevated railway lines used to travel over the Brooklyn Bridge, but today it is used by only motorized vehicles, pedestrians, and bicycles.

The weight of the Brooklyn Bridge is supported by four main cables. The four main cables have smaller suspender cables that hold up the bridge deck, which is made of a truss (structure of beams). The bridge deck is at a right angle to the two suspension towers. This is called a transverse truss.

Subway Construction Photograph Collection, New York Transit Museum.

LOOK

Take a moment to look closely at all of the details in this picture. What do you notice?

THINK and SHARE

- How is this bridge different from the Brooklyn Bridge above? How is it similar?
- What shapes can you find in this bridge?

DISCOVER

This is the Queensboro Bridge, a **cantilever bridge** that connects Long Island City in Queens with the Upper East Side of Manhattan. It was completed in 1909. It has two levels to transport vehicles. The upper level has four lanes for cars with two lanes in each direction, and the lower level has another five lanes for cars driving into Queens. You can also walk or bike over the lower lever.

Unlike The Brooklyn Bridge, the Queensboro Bridge has two levels and supports its weight with 5 **cantilever** posts. A **cantilever** is an anchored vertical post that can support two long arms that reach across each section of the bridge.

ACTIVITY

Now that we've seen two different kinds of bridges, suspension and cantilever, let's make a bridge using the scientific method! The scientific method includes a question and a hypothesis, or what you think might happen.

Materials: paper, pencil, 25 – 35 sheets of newspaper or other paper, tape

Question: How can we use newspaper and tape to create a bridge that will hold the weight of at least three books?

Hypothesis: Use bridge-building techniques that you think will be the strongest.

Example Hypothesis: A cantilever bridge will be able to hold 3 or more books by redistributing the weight from the vertical posts.

Step 1: Decide what kind of bridge you want to build and come up with your hypothesis. Make a drawing of your bridge design on a piece of paper.

Step 2: Roll each sheet of newspaper into tight scrolls. Tape the final twist to keep them rolled tight. It should be so tight that it's difficult to bend the scroll in half. Make scrolls in a variety of lengths, approximately 15", 5" and 3" long. Try to make twenty to fifty of each length.

Step 3: Tape three or four scrolls together to make triangle, rectangle, and diamond shapes. Make many repeated shapes and tape these shapes together to construct the bridge you designed.

Step 4: When your bridge is complete, it's time to test its strength. Set your bridge up to span the distance between two surfaces, such as chairs. Then place increasingly heavy objects on it to see how much weight it can hold.

Questions to think about:

1. Is your bridge wide enough to have multiple lanes?
2. What is too heavy for your bridge to hold?
3. Can you rethink your hypothesis and redesign your bridge to make it stronger?

Share photos of your bridges using #nytransitmuseum