

TLC ONLINE CURRICULUM

Lesson title:

Reaching New Heights

Grade level:

6, with adaptations for younger students

Subject areas

Historical Understanding, Mathematics, Technology, Geography

Duration:

One to two class periods

Objectives:

Students will understand the following:

1. The materials and technological advances that have made it possible to build taller and taller skyscrapers over time
2. Which skyscrapers have been considered the tallest in the world over the past 100 years, where these buildings are located, and when they were built
3. The complexity of designing and creating large structures such as skyscrapers

Materials:

For the introduction:

- Photos of the following skyscrapers (from book or encyclopedia or from the Web at <http://www.pbs.org/wgbh/buildingbig/skyscraper/index.html> or <http://www.skyscraper.org/tallest/tallest.htm>):
 - Empire State Building
 - Petronas Towers (in Kuala Lumpur, Malaysia)
 - World Building
- World map or globe
- Mural paper (8 to 10 feet long)
- Ruler or yardstick
- Markers

For each pair:

- Ruler or yardstick
- Pencils
- Markers
- Index card
- Print or online resources about famous skyscrapers

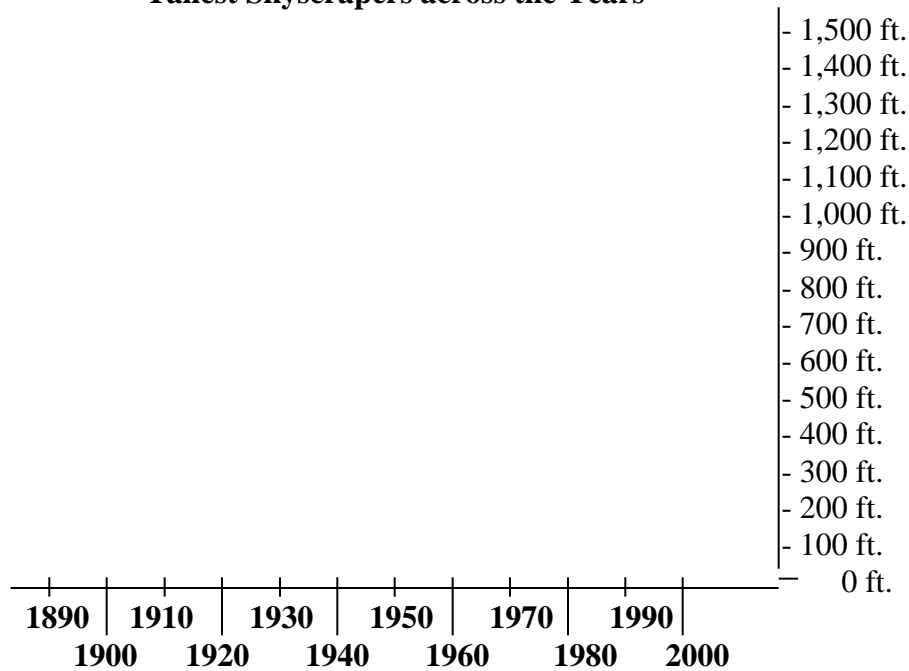
For each student:

- Take Home Activity Sheet: Skyscrapers of Tomorrow

Procedures:

1. Explain to the class that a skyscraper is a tall building in which the weight of the structure is supported by a weatherproof, strong inner framework. The word skyscraper was used in the 1880s, when the first tall buildings were built in the United States. But there are skyscrapers all over the world. These tall buildings can be found in magnificent skylines from Chicago to Hong Kong.
2. Show students a picture of the Empire State Building in New York City. Ask them to identify this skyscraper and where it's located. Explain that the Empire State Building is 1,250 feet high and has 102 stories. It was completed in 1931. At that time, it was the tallest building in the world. But since then, even taller buildings have been built.
3. Ask students to name other famous skyscrapers and the location of each, creating a list on the board. (The list might include the Sears Tower in Chicago, the Eiffel Tower in Paris, and the Empire State Building in New York.)
4. Ask if any students know what the tallest building in the world is today. Show a picture of the Petronas Towers in Kuala Lumpur, Malaysia. Explain that these towers were completed in 1998, are 1,483 feet high, and have 88 stories. Use the globe or world map to show students where Malaysia is located.
5. Now show students a picture of the World Building, the first skyscraper ever built. Explain that the World Building was completed in 1890 and was 309 feet tall. (The World Building no longer exists; it was demolished in 1955 to make room for the expanded automobile entrance to the Brooklyn Bridge.)
6. Ask students to identify the biggest change in skyscrapers from the World Building to the Empire State Building to the Petronas Towers. (They have gotten taller.) Tell the class that they'll be creating a graph/time line to show how skyscrapers have become taller over time. You could have students create the actual graph/time line or create it before class: Hang a sheet of mural paper on a classroom wall. Using a marker and a ruler or yardstick, draw a large graph. This graph will be used to show various skyscrapers by year (x-axis) and by height (y-axis). Along the x-axis, make 12 equally spaced marks. From left to right, label the marks with years in 10-year increments from 1890 to 2000. Along the y-axis, measure and mark off equally spaced increments of 100 feet (from 0 to 1,500 feet). Write a heading across the top of the mural, such as Tallest Skyscrapers across the Years. The mural will look something like this:

Tallest Skyscrapers across the Years



7. Discuss how students will use the y-axis to chart the height of each building and that the x-axis will serve as the time line. Explain that they will be working in pairs to learn about a famous skyscraper. Then they will draw and cut out an outline of that skyscraper and place it along the time line. Discuss the concept of scale that it's a way to show proportional relationships. In this case, the height of tall buildings (hundreds or thousands of feet) will be represented in inches. Write the scale underneath your graph/time line. (For example, depending on the size of your mural, it may be 2 inches = 100 feet.)

8. Have students choose partners and assign each pair one of the following skyscrapers:

Name	Location	Height (in feet)	Year Completed
Chrysler	New York City, N.Y.	1,046	1930
Empire State Building	New York City, N.Y.	1,250	1931
Manhattan Life	New York City, N.Y.	348	1894
Masonic Temple	Chicago, Ill.	302	1892
Metropolitan Life	New York City, N.Y.	700	1909
Park Row	New York City, N.Y.	386	1899
Petronas Towers	Kuala Lumpur, Malaysia	1,483	1998
Sears Tower	Chicago, Ill.	1,454	1974
Singer	New York City, N.Y.	612	1908
St. Paul	New York City, N.Y.	315	1898
Woolworth	New York City, N.Y.	792	1913
New York World	New York City, N.Y.	309	1890

9. Ask each pair to use books, encyclopedias, or the Web to research their assigned skyscraper. Each pair should write the following facts on an index card: (a) name; (b) location (city,

state, or country); (c) the year construction was completed; (d) the height of the building in feet; and (e) one “cool fact” about the skyscraper. Then ask them to use a ruler, poster board, markers, and scissors to draw and cut out an outline of their building. Be sure they use the same scale as the class graph/timeline.

10. Have each pair place their skyscraper outline on the appropriate year along the time line, with the index card above the skyscraper. When the time line is complete, have the class discuss the results. What interesting things do students notice about the information they charted?
11. As a homework assignment, hand out copies of the Classroom Take Home Activity Sheet: Skyscrapers of Tomorrow for each student to complete.

Adaptations

For younger students, instead of constructing a time line, have each student make a poster of a famous skyscraper. Each poster should include a drawing or photograph of what the building looks like. It should also include the year the skyscraper was built, where it’s located, and at least one additional interesting fact about the building.

Questions:

1. What are some of the different materials used to build skyscrapers? (Encourage students to consider various materials, such as glass, iron, steel, and concrete.)
2. Skyscrapers and other tall buildings are possible because of advancements in building technology and materials. Hypothesize discoveries that have made skyscrapers possible. Here are some examples: skyscrapers couldn’t exist until the elevator was invented by Elisha Graves Otis in 1852; tall cranes are needed to lift building materials to high places; scaffolding is required to support construction workers.
3. In addition to being an awesome sight, skyscrapers serve a purpose for society. Think about the skyscrapers you’ve visited or just know about. Where are skyscrapers generally built? Why do people build skyscrapers?
4. Over time, skyscrapers keep getting taller and taller all over the world. Why do people in different countries keep building tall buildings? Where do you think the next tallest skyscraper in the world will be built, and why?
5. Consider environmental factors that would affect tall structures such as skyscrapers. For example, could a skyscraper be built in the mountains? What about a place that has earthquakes?
6. Would you want to live or work in a skyscraper? Why or why not?
7. Why do you think many of the world’s tallest skyscrapers have been built in New York City?

Evaluation:

You can evaluate groups on their projects using the following three-point rubric:

Three points: worked cooperatively; successfully researched information about skyscrapers; understood the principles behind the time line (charting on the x- and y-axes, use of scale) and correctly charted information on the time line

Two points: worked cooperatively; successfully researched information about skyscrapers; had some difficulty charting skyscraper information on the time line; had some difficulty understanding the principles behind the time line (charting on the x- and y-axes, use of scale) and charting skyscraper information correctly on the time line

One point: had difficulties working cooperatively; had difficulty locating skyscraper information; did not understand the principles behind the time line (charting on the x- and y-axes, use of scale); and incorrectly charted skyscraper information on the time line

Extension ideas:

Plan a Building

Skyscrapers take a lot of time and money to build. Consider how long it might take to build a skyscraper from start to finish. What kinds of building materials, technology, and people power will the project take (examples: iron, steel, glass, concrete, architects, contractors, engineers, building workers, welding, elevators, cranes, beams, etc.)? Then, discuss the steps or phases involved in the project for example, architectural design, planning materials, selecting a site, laying the foundation, transporting materials to the site, putting up the frame, and completing the interior.

Buildings That Sway, but Stay!

Some skyscrapers are built in places that are subject to earthquakes and fires. For example, the First Interstate World Center in Los Angeles, California, was built to withstand an earthquake of the magnitude of 8.3 or bigger on the Richter scale. Research why skyscrapers like this one can survive earthquakes and other natural disasters.

Tall Buildings around the World

Create a class book of skyscrapers and other tall structures around the world. See how many different countries have interesting and impressive buildings.

Related links:

Building Big

<http://www.pbs.org/wgbh/buildingbig/skyscraper/index.html>

Search a database of famous skyscrapers.

The Skyscraper Museum

<http://www.skyscraper.org/>

Learn about a museum devoted to skyscrapers!

The Social Construction of the Skyscraper

<http://xroads.virginia.edu/~1930s/DISPLAY/chrysler/front.html>

Read facts and history about the Chrysler Building in New York City.

Suggested Readings:

Build It!: Activities for Setting Up Super Structures.

Keith Good, Lerner Publications, 1999.

The simple, illustrated projects in this book will provide an understanding of how different structural elements, designs, and materials affect the stability, strength, and balance of a variety of structures when they are subjected to varying forces and loads.

Building Big

David Macaulay, Houghton Mifflin, 2000.

The celebrated author/illustrator of this book examines the construction of some of the most famous examples of the structures we see or use every day - bridges, tunnels, skyscrapers, dams, and domes. He looks at the problems the builders of each structures faced and how those problems were overcome by ingenious design, use of materials, and construction methods.

Bridges!: Amazing Structures to Design, Build, and Test

Carol A. Johmann and Elizabeth J. Rieth, Williamson Publishing, 1999.

This book provides descriptions and the history of all types of bridges. It contains many simple projects that demonstrate how structural engineers design and build bridges that are safe and effective. Numerous accompanying sidebars, drawings, and photographs expand on the text and illustrate how bridges work.

Vocabulary:

architecture

Definition: The art and practice of designing and building structures.

Context: The Empire State Building and the Eiffel Tower are examples of famous works of architecture.

concrete

Definition: A mixture of water, sand, small stones, and a gray powder called cement.
Context: The foundations of large buildings are made from poured concrete.

engineering

Definition: A profession that applies math and natural science to develop ways to use the materials and forces of nature to design and build structures such as roads, bridges, dams, or machines.

Context: People who build skyscrapers use engineering to choose the right materials and designs for the buildings.

Richter scale

Definition: Used to measure the magnitude of an earthquake; introduced in 1935 by the seismologists Beno Gutenberg and Charles Francis Richter.

Context: In 1989, an earthquake measuring 7.1 on the Richter scale shook the San Francisco Bay Area in Northern California, damaging bridges, buildings, and highways.

skyscraper

Definition: A tall building in which the weight of the structure is supported by a weatherproof, strong inner framework.

Context: The Empire State Building and Sears Tower are examples of famous skyscrapers in the United States.

story

Definition: A floor of a skyscraper.

Context: The Empire State Building has 102 stories.

Academic standards

Grade level:

6-8

Subject area:

Mathematics

Standard:

Understands and applies basic and advanced properties of the concepts of geometry.

Benchmarks:

Understands the mathematical concepts of similarity (e.g., scale, proportion, growth rates) and congruency.

Grade level:

3-5

Subject area:

Historical Understanding

Standard:

Understands and knows how to analyze chronological relationships and patterns.

Benchmarks:

Knows how to interpret data presented in time lines (e.g., identify the time at which events occurred; the sequence in which events developed; what else was occurring at the time).

Grade level:

3-5

Subject area:

Mathematics

Standard:

Understands and applies basic and advanced properties of the concepts of geometry.

Benchmark:

Understands how scale in maps and drawings shows relative size and distance.

Credit:

Nancy Waks, senior editor at Sesame Workshop, designer and writer of online educational materials for grades K-12.

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Skyscrapers of Tomorrow

Pretend you're an architect hired by Donald Trump to design the skyscraper of the future. It's completely up to you what it looks like, what it's made of, and how it's used - be as creative as you like!

Skyscraper name: _____

Designed by (your name): _____

Height in feet: _____

Number of stories (floors): _____

Location: _____

Describe what materials your skyscraper will be made from:

Describe any special designs or materials that reflect the time period or location of your new building:

Explain how this building will be used. Will people live here? Work here? Both?

On the back, draw a picture of your new building. Draw a simple scale next to the building to show its height.