
THE EMPIRE STATE BUILDING

EDUCATIONAL MATERIALS

TECHNOLOGY:
GRADES 3-5



THE EMPIRE STATE BUILDING: TECHNOLOGICAL TITAN

**Exhibit Connections:
Construction; 1931-Today; Modern Marvel;
Otis Elevators; Artistry in Light**

OVERVIEW OF LESSON PLAN

The Empire State Building has been a beacon of technological advancement since it was built 90 years ago (as of 2021). By staying at the top of the field in technological upgrades, it remains an innovative example of sustainability. In this technology-focused field trip, students will leverage the technology they are learning in the classroom to plan for their trip, explore the technological advances made in the Empire State Building's recent past, and tinker with simple circuits to make light sculptures as beautiful as the Empire State Building's iconic spire in the New York City night sky.

OBJECTIVES

Students will:

- Gain a deeper understand of the Empire State Building's energy efficiency initiatives
- Utilize the Empire State Building's exhibits to answer questions during their trip
- Create Empire State Building spire-inspired LED art by experimenting with simple paper circuits

SUGGESTED TIME ALLOWANCE

One hour

RESOURCES/ MATERIALS:



- Pencil
- Provided worksheets
- An LED circuit kit is required for the post-trip activity:
 - Copper tape
 - Gumdrop LEDs in varying colors
 - Coin cell batteries
 - Tape, scissors, colorful paper, and other assorted decorative art supplies

- Video:

[Street Magic With The Empire State Building!](#)

- Teachers might find this article useful by

[The Washington Post](#)

ACTIVITIES/ PROCEDURES:

PRE-TRIP ACTIVITY

In preparation for their field trip to the Empire State Building, students will explore the website to learn more about the ways that this incredible building has remained at the forefront of innovation throughout its 90-year life.

In a group discussion, find out what the students already know about this amazing skyscraper. Students will explore the website and build a three-slide presentation outlining what they are most excited to see in person.

Starting with the [About Page](#), students can use the drop-down menu or follow links in the text to learn more about the history, architecture, or tower lights at the Empire State Building.

- Lead a facilitated class discussion about the Empire State Building. What do the students already know?
- Have the students turn and talk to their neighbors asking each other, “What do you wonder about the Empire State Building?”
- Allow time for the students to share what they discussed and record the students’ ideas on the board or chart paper.
- Next, introduce the link to the website and allow students independent time to thoroughly explore it and create their three-slide presentation.

For homework, ask students to continue to explore other aspects of the Empire State Building website. They can navigate to the [Technology & Sustainability](#) page to learn more about the amazing innovations in the Empire State Building’s Green Initiative. They can write a paragraph, or two, outlining what they learned and/or what they are most excited to see in person.

ON-SITE ACTIVITIES One hour

Exhibit: Construction (20 minutes)

The Empire State Building was and remains a technological marvel. Without the use of modern machinery, it was erected in a record amount of time. As the building is being built all around you, take a moment to observe the machinery being used. Use the worksheet chart to identify and sketch examples of simple machines being used by the workers during construction.

EXHIBIT: 1931-TODAY (10 minutes)

When it opened in 1931, the Empire State Building was a stylish, efficient workplace and a gleaming symbol of international modernity. In its nearly 100 years of history, the Empire State Building has stayed at the cutting edge of technology, even when that meant carrying a pager. Take a look through the timeline and record your observations of how the hardware has improved through the decades.

EXHIBIT: MODERN MARVEL AND OTIS ELEVATOR (15 minutes)

The Empire State Building has made many modern improvements to the building's energy efficiency, design, and environmental impact. Use the signage and touch panels in the exhibit to answer the questions on the worksheet.

The Otis Elevator Company created an innovative and new elevator system for the Empire State Building twice—the first in 1931, then again in 2011.

EXHIBIT: ARTISTRY IN LIGHT (15 minutes)

The newly reimagined and re-engineered lighting display of the Empire State Building's spire has quickly become a staple of the way New York City celebrates its holidays. Record three color combinations and their corresponding holidays. Use the exhibit signage to answer the questions below.

HOMEWORK/FURTHER DISCUSSION

In small groups, students can research the current tallest buildings in the world to compare and contrast its construction with the Empire State Building's. What technology is the same? What is different? How do other skyscrapers compare to the Empire State Building's energy efficiency efforts?

POST-TRIP ACTIVITY

After unpacking the amazing sights from their trip to the Empire State Building, students will experiment with LED and batteries to create a circuit on paper. From this exploration of the basic circuit, students can expand on their own creativity to create a wide variety of light-up creations.

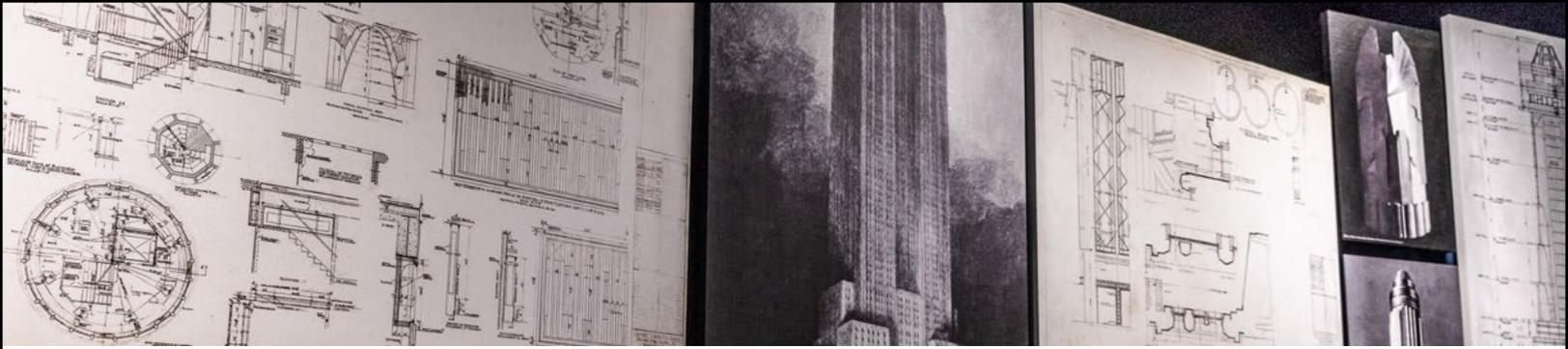
Watch **Street Magic With The Empire State Building!**

- Lead a facilitated class discussion about the Empire State Building trip.
- Ask the students to turn and talk to their neighbors, asking them "What do you remember about the trip?"
- Allow time for the students to share what they discussed and record the students' ideas on the board or chart paper.
- Next, discuss the Artistry in Light exhibit, the variety of color combinations, and the different holidays/events they signified.
- Record the color combos and events the students recall.
- In a large group, introduce the LEDs, copper tape, and batteries. Then demonstrate making a simple circuit on paper.
- Allow plenty of time for the students to create paper circuit creations.

EVALUATION AND ASSESSMENT

Students can be evaluated based on their participation in the large group discussions, as well as their paper circuit creations. Teachers may assess student work based on the number of historically accurate facts included in their writing, level of detail, proper context, etc. Older students will make well-supported personal, cultural, textual, and thematic connections across genres.

Modifications can include providing students with a chart for notetaking, sentence frames, and visual aids to organize their observations during the field trip, or students can be asked to write a shorter piece or create an infographic instead of writing.



CONNECTIONS TO THE STANDARDS

International Society for Technology in Education (ISTE) Standards

EMPOWERED LEARNER - Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.

1d - Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

KNOWLEDGE CONSTRUCTOR - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

3a - Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

INNOVATIVE DESIGNER - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

4a - Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

4c - Students develop, test and refine prototypes as part of a cyclical design process.

4d - Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

CREATIVE COMMUNICATOR - Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

6b - Students create original works or responsibly repurpose or remix digital resources into new creations.

6c - Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

PRE-TRIP WORKSHEET

NAME _____

DATE _____

PREPARING FOR YOUR TRIP TO THE EMPIRE STATE BUILDING!

In preparation for their field trip to the Empire State Building, explore the website to learn more about the ways that this incredible building has remained at the forefront of innovation throughout its 90-year life. First, in a group discussion, find out what your classmates already know about this amazing skyscraper. Starting with the [About Page](#), take some time to explore the informational pages on the website. You can use the drop-down menus to learn more about the history, architecture, or tower lights at the Empire State Building. Next, build a three-slide presentation outlining what you are most excited to see in person.

Use the space below to jot down notes about what you discover and begin to plan your three-slide presentation.

Notes:

Slide 1

Slide 2

Slide 3

TRIP WORKSHEET

NAME _____

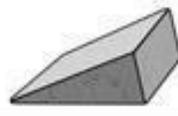
DATE _____

WELCOME TO THE EMPIRE STATE BUILDING!

EXHIBIT: CONSTRUCTION

The Empire State Building was and remains a technological marvel. Without the use of present day modern machinery, it was still erected in a record amount of time. As the building is being built all around you, take a moment to observe the machinery being used. Use the chart below to identify and sketch examples of simple machines being used by the workers during construction.

SIMPLE MACHINES



Wedge

Wheel & Axel

Lever

Inclined Plane

Screw

Pulley

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EXHIBIT: 1931-TODAY

When it opened in 1931, the Empire State Building was a stylish, efficient workplace and gleaming symbol of international modernity. In its nearly 100 years of history, the Empire State Building has stayed at the cutting edge of energy efficiency and technology.

Take a look through the timeline and record your observations of how the building's energy consumption has improved through the decades.

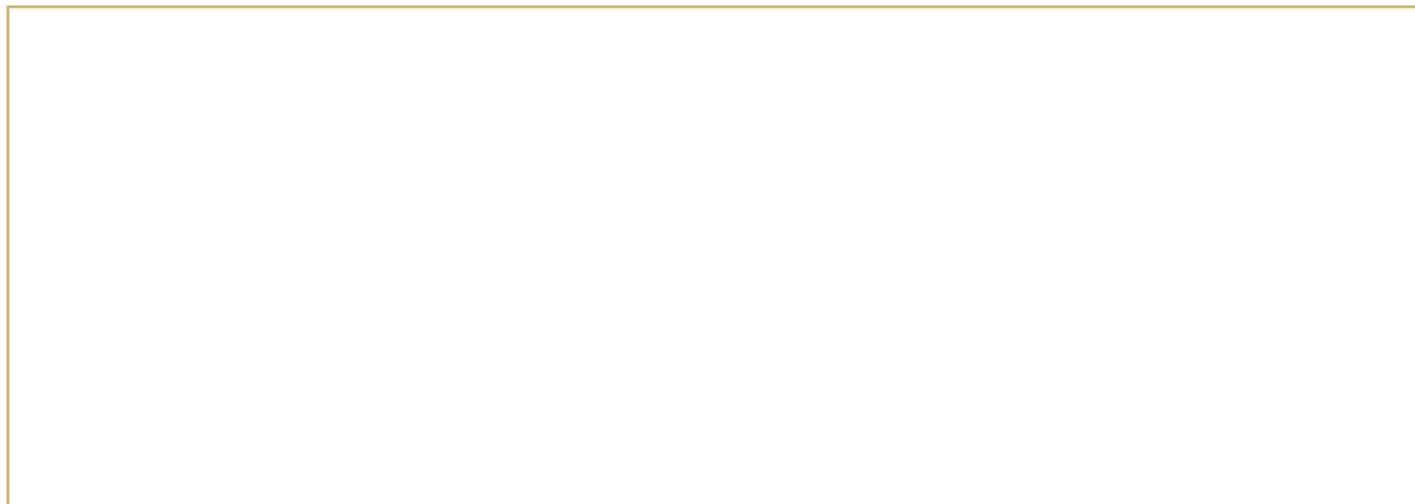


EXHIBIT: MODERN MARVEL AND OTIS ELEVATOR

The Empire State Building has made many modern improvements to the building's energy efficiency, design, and environmental impact.

The Otis Elevator Company created an innovative and new elevator system for the Empire State Building twice—the first in 1931, then again in 2011.

Use the signage and touch panels in the exhibits to answer the questions below.

1931 OTIS ELEVATORS:

How many elevator cars were there?

How many trips per day did they make?

How many miles of rope were used?

2011 OTIS ELEVATORS:

How many trips per year?

How much more efficient (%) are the new elevators during rush hour?

If 20% of New York City's largest buildings follow the Empire State Building's example, the city's total energy consumption could reduce by how much (%)?

How many tower lights were changed to LED fixtures?

How many windows were rebuilt with the insulating krypton/argon gas?

EXHIBIT: ARTISTRY IN LIGHT

The newly reimagined and re-engineered lighting display of the Empire State Building's spire has quickly become a staple of the way New York City celebrates its holidays. Record three color combinations and their corresponding holidays. Use the exhibit signage to answer the questions below.

What is the name of the Empire State Building's lighting designer?

How many color combinations can the Empire State Building's lighting system create?

Record 3 color combinations, and the corresponding holiday/event:

1. _____

2. _____

3. _____

POST-TRIP WORKSHEET

NAME _____

DATE _____

CREATE A CIRCUIT

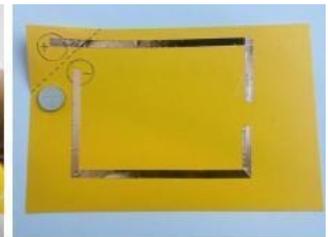
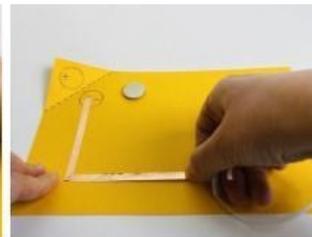
Now that you have experienced the amazing Empire State Building's innovative design, it's time to begin exploring some technical design of your own! After viewing the Artistry in Light exhibit at the Empire State Building, discuss the color combinations you discovered. What are some that your classmates noticed?

It's time to create your own colorful combination in light! Using LEDs, copper tape, batteries, and paper, create a simple circuit to light up the LED. Feel free to get creative, but use this guide to get started:

Materials:



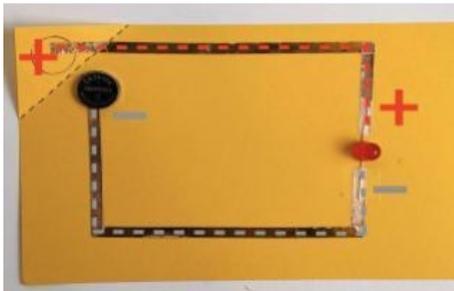
- Variety of craft paper
- Glue sticks/clear tape
- Various other art supplies
 - pipe cleaners
 - markers
 - scissors
 - stickers, etc.



LEDs have two legs of unequal length: the longer one is the positive (+) side of the LED, and the shorter leg is the negative (-) side.

Fold over one corner of the paper and trace the battery on either side of the fold.

Try taping down two strips of copper tape with each piece starting from one of the circles and ending about a half inch apart.



Tape down one LED with the legs touching on the copper. Connect the "+" side of the battery to the "+" leg of the LED, and "-" side of the battery to the "-" leg of the LED.

Fold the corner to see the LED lights up. If it doesn't light up, try flipping the battery to make sure the positive side of the battery connects to the positive leg of the LED.



Now that you've created your first circuit, let your imagination run wild! What color combos can you create? What holidays or events do they celebrate? Sketch your final design(s) in the space below (or on the back of this page). Don't forget to show the path of your circuit!

TEACHER ANSWER KEY/DATA

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Use the signage and touch panels in the exhibits to answer the questions below.

1931 OTIS ELEVATORS:

How many elevator cars were there?

73

How many trips per day did they make?

85,000

How many miles of rope were used?

120 miles

2011 OTIS ELEVATORS:

How many trips per year?

10 million

How much more efficient (%) are the new elevators during rush hour?

50%

If 20% of New York City's largest buildings follow the Empire State Building's example, the city's total energy consumption could reduce by how much (%)?

25%

How many tower lights were changed to LED fixtures?

400

How many windows were rebuilt with the insulating krypton/argon gas?

6,514

EXHIBIT: ARTISTRY IN LIGHT

The newly reimagined and reengineered lighting display of the Empire State Building's spire has quickly become a staple of the way New York City celebrates its holidays. Record three color combinations and their corresponding holidays. Use the exhibit signage to answer the questions below.

What is the name of the Empire State Building's lighting designer?

Marc Brickman and his design collective

How many color combinations can the Empire State Building's lighting system create?

16 million

Record 3 color combinations, and the corresponding holiday/event:

1. _____ **Ex. Rainbow for Pride Day** _____

2. _____ **Ex. Red and Pink for Valentine's Day** _____

3. _____ **Ex. Red, White, & Blue for July 4th** _____