

Hot Air for Hope
Free Community Balloon Event
May 17-19, 2024
Lampe Park
Gardnerville, NV



LIVE BALLOON DEMONSTRATION
AT YOUR SCHOOL IS
SCHEDULED FOR _____

TEACHER INFORMATION AND LESSON PLANS

***All HANDOUTS are on www.hotairforhope.com**

“Up, Up and Away in My Beautiful Balloon...”

Hot air balloons can be seen throughout the Carson Valley on most weekends: if you're up early in the morning! These colorful giants are piloted by local residents who genuinely love the beauty and wonder of silent flight.

OUR Local pilots, called *aeronauts*, have created the first (and hopefully annual) Balloon Festival for Carson Valley. The public will be able to view the several planned launches and FREE accompanying public events on May 19-21, 2023, while the two dozen pilots will be competing in one leg of a 3-event Nevada State Balloon Championship. The weekend is a FREE family-friendly event, and a fundraiser for the Center for Hope and Healing in Gardnerville (<https://douglascenterforhopeandhealing.org>)

Hot Air Ballooning is the oldest form of aviation, and a fascinating way for students to learn basic STEM lessons. The following lesson plan ideas can help your students understand the science behind hot air ballooning and all the scientific uses for balloons beyond recreational flight.

Sharing some of the preview information or videos with students prior to the presentation at their school will help add to their depth of understanding, and enrich the live experience of watching a hot air balloon inflation on their campus.

Most of all, a huge thanks to you teachers. You rock.

PACKET CONTENTS: (ALL LESSON HANDOUTS ON www.hotairforhope.com)

1. Background Balloon Information for Teachers
2. Lesson ideas for K-2
3. Lesson ideas for 3-6
4. Lesson Ideas for 6-8
5. Lesson ideas for 9-12

HERE'S SOME BALLOON INFO FOR TEACHERS

BALLOON HISTORY:

On June 4, 1783, French brothers Joseph-Michel and Jacques-Étienne Montgolfier sent aloft a 35-Ft diameter balloon filled with heated air and ferrying 3 farm animals. They later substituted prisoners, who, needless to say, were not volunteers. Thus, this type of man-made flight predated the Wright Brothers by 120 years.

Today, hot air balloons are used for recreation, weather measurements and surveillance.

How many hot air balloons are there in the United States?

There are only roughly 3,000 balloons registered in the United States, with between 5,000 to 6,000 hot air balloon certificated pilots. Nevada has approximately 50 licensed pilots, and half of them are in the Reno/Carson Valley areas. Many of those pilots are women who fly their own balloons. Local Northern Nevada pilots come from all types of occupations; police officers, cable installers, engineers, librarians, graphic designers, and TEACHERS.

Balloon Events and Competitions

Balloon pilots also compete with one another on a state, national and international level: pilots maneuver their balloons to reach the closest to a designated in-air target point determined by specific GPS points, or throw a bean bag onto a giant "X marks the spot" target on the ground.

Balloon festivals, like the one planned for the Carson Valley on May 19-21, are held all over the world: the largest is in Albuquerque, N.M. each October. The 2022 Albuquerque event was the 50th. **First Place out of 600 balloons was ALLEN ANDERSON, SR. of MINDEN, NV!** Allen, a retired East Fork Fire District captain, has been a pilot and balloon pilot instructor for more than 40 years in Nevada.

Allen, one of the organizers of the Carson Valley Hot Air for Hope event, is also the only 5-time winner of the Great Reno Balloon Race: the largest free hot-air ballooning event in the country, and is held the first weekend after Labor Day each September at Rancho San Rafael Regional Park in Reno, Nevada. The GRBR draws in a crowd of 140,000 on average each year, making it the largest free event in Northern Nevada.

Do you need to be licensed to fly a hot air balloon?

Yes. To fly a hot air balloon you need to have flight and classroom instruction, take a written test and take a flight test with an FAA examiner. Pilots must learn the science of wind and weather patterns in order to fly.

How do balloons fly?

Science! As magical as balloon flight seems there is actual science behind what makes a balloon lighter than air. A heater system, called a burner, takes vaporized propane and burns it producing a huge, hot flame! A burner output is around 9 million BTUs, in contrast the average heater in a home is around 90,000 BTUs - 100X more. The air is heated inside the envelope which causes

the air to be less dense than the air outside of the envelope. Being less dense, hot air rises. The balloon envelope is the container which holds in this hot air. To rise, the air is heated, to descend, the air in the envelope must cool or a vent on the top of the balloon is opened by a rope to allow some of the hot air to escape, causing a faster descent.

Can you steer a hot air balloon?

No, not in a conventional way. Unlike other aircraft or cars, balloons have no direct means to control their *horizontal* movement. However, balloon pilots can control the *vertical* movement of the balloon within inches! Balloon pilots use this fine amount of vertical control to climb or descend into different winds at different altitudes. Sometimes the wind at 500 feet is the complete opposite direction of the wind at 1000 feet! Pilots use their knowledge of the local wind patterns and wind measurements to roughly plan their flight path. By no means is this precise. They never know exactly what the winds will be at a given altitude, which is all part of the fun and adventure of ballooning!

How high do hot air balloons fly?

The world record for a hot air balloon is 69,000 feet! However, commercial ride balloons fly at much lower altitudes. The local company, Tahoe Balloons, sometimes reaches 10,000 feet, and gives riders a view of Lake Tahoe from the air. The joy of ballooning comes from flying low over the terrain! They can also fly from inches off the ground.

What does it feel like to ride in a hot air balloon?

Flying in a balloon is the feeling of pure freedom, gently drifting silently along with the air currents. The unobstructed panoramic views are like none other. It is peaceful, quiet and calm, yet adventurous, exciting and exhilarating!

Is it cold up there?

The simple answer is that it is about the same temperature as on the ground. The best flying is on COLD, calm mornings, so the Carson Valley has pilots who fly frequently in the winter. The calmest air is just after daybreak so pilots often rise between 3-4 a.m. to check weather readings prior to flying at just after dawn. Balloons don't normally fly high enough to feel the effects of heat loss due to altitude. While the burner puts out a lot of heat that heat is rising up into the envelope. That said, balloons float along with the wind and don't experience any kind of wind chill factor like you may feel on other aircraft or skydiving.

Where do balloons land?

Without accurate directional control, pilots are never 100% sure where they will land. That is part of the adventure of ballooning! They try to plan on some landing areas based on winds and launch location, but it is never a sure thing to land in a certain spot! Local balloon pilots land in parks, backyards, fields, parking lots and even cul-de-sacs! Maybe some of you in Carson Valley have had a balloon land in your neighborhood. An important part of ballooning is establishing long lasting relationships with area landowners so that pilots can use their land as a landing site! Without the generosity of landowners letting pilots land on their property ballooning would be in trouble.

Is it considered an actual aircraft?

Yes. Balloons are an FAA certified and registered aircraft. Pilots must take the balloon to a repair station every year or 100 hours of flight time (whichever comes first) where it undergoes an in-depth inspection. There are several sizes of balloons and baskets, depending on the number of passengers; there are one-person baskets, designed to be used for racing balloons and larger baskets that can hold 16 passengers. The more passengers, the larger the balloon must be.

What is the balloon made from?

Balloon baskets are made of rattan wicker and wood. Wicker is strong, yet flexible and has been used for many, many years in hot air balloon baskets because of its lifespan, ease of care, strength and flexibility! The envelope (the “balloon” part) is made of a rip-stop nylon or polyester fabric that is coated with a special coating to extend its lifespan.

What does a balloon use for fuel?

Propane, which is held in large canisters inside the basket. Literally the same propane that you use in your backyard grill! There ARE other balloons which use helium, or hydrogen, but they are very expensive to operate, and are usually used for longer, non-passenger flights

How much does it cost for a hot air balloon ride?

Depends on where you take it. It is not inexpensive - approx. \$300 per person for a 2 hour ride. The cost is high to operate: each flight can use up to \$400 worth of propane, plus the cost for the pilot and crew who set up and take down the balloon.

What can I teach my students?

- The youngest children can learn why some things FLOAT in water or in AIR. How is a floating balloon they get at a birthday party or carnival like the giant balloons that carry people?
- Basic math lesson can be worked into the air mass needed to inflate the balloon in order to carry a specific amount of weight. How big does the balloon need to be to carry 12 passengers vs. 2?
- Science lesson: balloons are used by NASA to study the atmosphere. How do balloons measure weather?
- History lesson: balloons have been used in wartime since the Civil War for silently spying on enemies. China has been using them to spy on the U.S. recently. Why are balloons still used?

•Reality of Balloon flight vs. Movies: Watch the Disney movie “Up.” Can it happen in real life?

Grades K-2

VIDEOS:

1. How Do Hot Air Balloons Work?

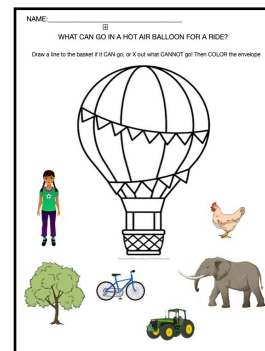
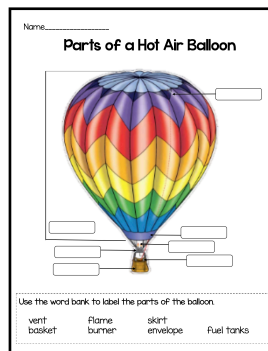
Explains the basic science principles

<https://youtu.be/ABsV41-EeY>

2. Hot Air Balloon Flying for Kids - 2 minutes

<https://youtu.be/wrzpaVbfyd8>

LESSON HANDOUTS: (AVAILABLE ON WWW.HOTHAIRFORHOPE.COM)

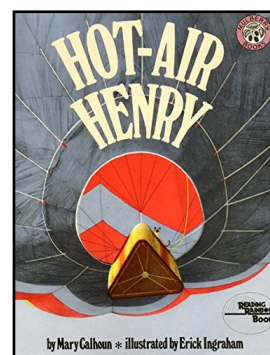
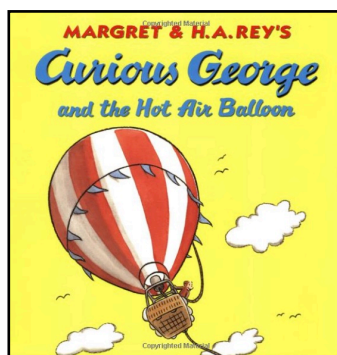
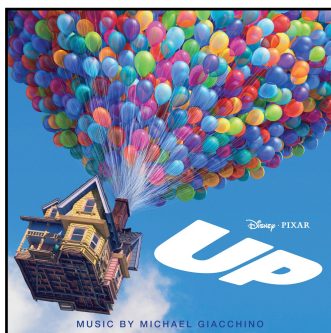


Is It A Pattern?

Parts of a Balloon

Coloring Balloon

Watch Disney’s “UP” or read CURIOUS GEORGE AND THE HOT AIR BALLOON or HOT-AIR HENRY, by Mary Calhoun (*we have a copy you can borrow*)



Grades 3-6

VIDEOS:

1. Michelle Gay, Science Teacher explains
[HTTPS://YOTU.BE/H11Z770KpyE](https://youtu.be/H11Z770KpyE)

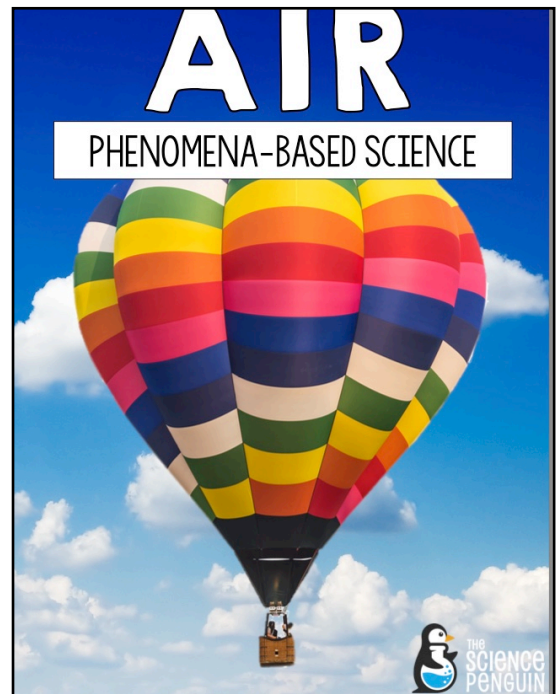
STEM using hot air balloons. In this video students will learn how hot air balloons stay up in the air because of buoyancy.

2. How Do Hot Air Balloons Work? - Explains the basic science principles
<https://youtu.be/ABsV41-EeY>

3. Handyman Hal Explores a Hot Air Balloon - video demonstrating balloon inflation with easy to understand concepts
<https://youtu.be/ErW1mazb5lo>

LESSON HANDOUTS: (AVAILABLE ON WWW.HOTHAIRFORHOPE.COM)

- HOT AIR BALLOON SCIENCE PHENOMENON (5TH GRADE)
- STEMHotAirBalloonsProject
- HOT AIR BALLOON PARTS
- BALLOON IN A BOTTLE
- HOW THEY FLY (info)





Grades 6-9

VIDEOS:

1. SciOnTheFly: Tissue Paper Hot Air Balloons

<https://youtu.be/Aazlvwdgyxw>

2. How It's Made Hot Air Balloons - steps factory takes to make balloons - INTERESTING!
- 8 minutes

<https://youtu.be/KFTSu1NzHM>



3. How Do Hot Air Balloons Stay Up?.... 7 minutes

<https://youtu.be/AqhnZz17amw>

4. Moment of Science: How to Fly (and Steer) a Hot Air Balloon

<https://youtu.be/QFW2wnZwSyc>

4. Hot Air Balloons used to monitor weather - 4 minutes

<https://you.be/AnQraD7jSG4>

LESSON HANDOUTS: (AVAILABLE ON WWW.HOTHAIRFORHOPE.COM)

- HOW THEY FLY text
- HOT AIR BALLOONS INFO HANDOUT
- LIGHTER THAN AIR/BUILDING A HOT AIR BALLOON
- HOT AIR BALLOON UNIT GRADE 6-8
- HOT AIR BALLOON WORD SEARCH PUZZLE (with answer key)
- HOT AIR BALLOONS AND INVENTORS (with answer key)

Grades 9-12

HIGH SCHOOL

VIDEOS:

1. WindRiders - Documentary (56 min)

<https://youtu.be/E1S-pAPBGUw>

2. Analysis: How Spy Balloons Work (PBS)

<https://www.pbs.org/newshour/nation/analysis-how-spy-balloons-work-and-what-information-they-can-gather>

3. “What China is trying to accomplish with repeated incursions into U.S. airspace (teacher background)

<https://youtu.be/B3bkTqIBbTw>

4. B-Line to Space: The Scientific Balloon Story.

(NASA) - 22 minutes

<https://youtu.be/sPQ-tMoAHky>

B-Line to Space: The Scientific Balloon Story is about NASA’s scientific balloons, which are used to conduct scientific investigations in astrophysics, heliophysics and atmospheric research. Science balloon flights can run hours to multiple days or weeks for longer-term exposures and data collection.

NASA’s Wallops Flight Facility in Virginia manages the agency’s Scientific Balloon Program with 10 to 15 flights each year from launch sites worldwide. NASA’s Columbia

Scientific Balloon Facility (CSBF) in Texas, provides mission planning, engineering services and field operations for the program. The CSBF team has launched more than 1,700 scientific balloons in the over 35 years of operation.



For more information on NASA's Scientific Balloon Program, visit: www.nasa.gov/scientificballoons.

To follow along with the missions, visit NASA's Columbia Scientific Balloon Facility's website at <https://www.csbf.nasa.gov> for real-time updates of a balloon's altitude and GPS location during flight.

LESSON HANDOUTS: (AVAILABLE ON WWW.HOTHAIRFORHOPE.COM)

- HOT AIR BALLOON SCIENCE PROJECT: HEAT AND MATTER
- Balloon ScienceHS: How a How Air Balloon Works and its Major Parts
- How Do Weather Balloons Work
- HOT AIR BALLOONS (basic info handout)
- BALLOON VOCABULARY
- LIGHTER THAN AIR/BUILDING A HOT AIR BALLOON
- HOT AIR BALLOON WORD SEARCH (key provided on separate file)