



## Lesson 6 – Hot Air Balloon Lab

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**Subject Area:** Science

### **Learner Outcomes:**

1. The student will be able to work in a lab environment to do a discovery learning activity.
2. They will follow lab safety guidelines and be able to identify variables that will affect their balloons.
3. They will manipulate these variables in their design and construction of their individual experiments.
4. The students will use the materials to create a “hot air balloon” and will test launch their construction in the classroom.

**Lesson time:** possibly two 45–50 minute periods

**Materials:** Dry cleaning bags, several small paper clips, scotch tape, heat source (blow dryer, sterno, Bunsen burner,) matches

\*\* If you use something with an open flame, you may want to use approximately 3 feet of aluminum heat duct with holes drilled in it near the bottom to permit air to flow in.

**Third Grade CSO’s:** SC.3.1.1, SC.3.2.1, SC.3.2.4, SC.3.2.5, SC.3.3.2.

### **Background Information:**

Hot air is less dense than cold air. Heat accelerates the motion of the air molecules causing fewer molecules to occupy the same space as a much greater number of molecules do at a lower temperature. With fewer molecules, the hot air has less mass, and therefore is more buoyant than an equal volume of colder air.

Placing the dry cleaning bag over the heat source captures the hot air and forces out the cooler air in the bag. The bag becomes a mass of low-density air which floats upward in the higher denser air surrounding it. The paper clips are placed at the bottom of the bag to keep the open end downward in flight to prevent it from prematurely spilling the hot air and terminating the flight.

### **Procedure:**

This will be a hands-on activity for the students showing lift of hot air.

1. Seal any openings and tears in the upper end of the bag with a minimum of scotch tape.
2. Attach several paper clips to the plastic around the lower opening. The number of paper clips to attach is determined by experimentation.



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3. Turn on the blow dryer (or light the Sterno or burner and then set the heat duct over it.) Spread the bag opening wide to capture the rising hot air while supporting the upper end with your hand. (It is best to have assistance in keeping the bag open so that it does not melt.)
  4. When the bag is inflated with hot air, test its buoyancy by letting it go for a moment. If it rises quickly, stand back and let it fly, otherwise continue heating it for a little while longer.
  5. If the bag tips over and spills its hot air before it reaches the ceiling add a few more paper clips to weigh down the bottom slightly. If the bag will not rise at all, remove a few clips.

**\*\*Caution:** Be careful not to brush clothes or fingers into the flames or touch the metal heat duct. Keep a fire extinguisher handy if you use flames. If the bag starts to crumple and melt from the heat, set the blow dryer on a lower setting or hold the bag farther from the heat source.

**Assessment:** Class participation, Successful launch of drycleaner balloon