

## INSPIRE GK12 Lesson Plan



<b>Lesson Title</b>	Gases - Air
<b>Length of Lesson</b>	30 – 45 minutes
<b>Created By</b>	Lucas Pounders
<b>Subject</b>	Physical Science
<b>Grade Level</b>	9 <sup>th</sup> - 12 <sup>th</sup>
<b>State Standards</b>	1b,c,e,g; 2,a,b;
<b>DOK Level</b>	2,4
<b>DOK Application</b>	Predict, Observe, Analyze, Prove
<b>National Standards</b>	A. Inquiry
<b>Graduate Research Element</b>	Use and properties of gases.

### **Student Learning Goal:**

This lesson will focus on the properties of air. It is designed to show that air can exert pressure, take up space and has weight as it pertains to the topic of solids, liquids and gases.

State Standards:

### **INQUIRY**

#### **1. Apply inquiry-based and problem-solving processes and skills to scientific investigations.**

b. Identify questions that can be answered through scientific investigations. (DOK 3)

c. Identify and apply components of scientific methods in classroom investigations. (DOK 3)

- Predicting, gathering data, drawing conclusions

e. Analyze procedures and data to draw conclusions about the validity of research. (DOK 3)

g. Communicate effectively to present and explain scientific results, using appropriate terminology and graphics. (DOK 3)

#### **2. Describe and explain how forces affect motion.**

a. Demonstrate and explain the basic principles of Newton's three laws of motion including calculations of acceleration, force, and momentum. (DOK 2)

- Net force (accounting for gravity, friction, and air resistance) and the resulting motion of objects

- Net work on an object which contributes to change in kinetic energy (work-to-energy theorem)

National Standards:

Physical Science

A. Science as Inquiry

9-12 Motions and forces, Interactions of energy and matter



**Materials Needed (supplies, hand-outs, resources):**

Experiment 1.) Air takes up space

1+ gallon bucket approximately a foot deep  
two beakers or cups

Experiment 2.) Air Pressure (and takes up space)

Airzooka, or homemade air thrower (instructions-[http://www.instructables.com/id/air-zooka-medium./](http://www.instructables.com/id/air-zooka-medium/))

Candle

Lighter

Experiment 3.) Air has weight

Electronic gram scale with decimal places

two balloons

Yard stick

needle

tape

**Lesson Performance Task/Assessment:**

This lesson has been fashioned around three demonstrations that use air as a gas.

The first demonstration the effects of volume through the use of air transfer with a bucket full of water and two beakers.

Experiment 1.)

- a. Fill one glass with water from the bucket and hold both glasses in the air marked with different tape or marker in order to differentiate..
- b. turn empty glass, top down, and submerge both glasses
- c. Once submerged, turn the full glass, top down and slide the empty glass underneath still holding both glass, top down.
- d. turn the empty glass, top up, slowly releasing the air into the filled glass and running the water out.
- e. Lastly, pull the glasses out and show that the now empty glass used to hold water but now is filled with air.

(This experiment is better done with a clear bucket or container)

Ask the students to record how this proves that water occupies space.

Next you will demonstrate air pressure with the candle and Airzooka.

Experiment 2.)

- a. Place the candle where the students can see it clearly and light the wick with the lighter.
- b. Take the candle and place it as far away as possible while still allowing the wind from your Airzooka to effectively blow out the candle.
- c. Use the Airzooka to blow out the candle.
- d. Ask the students to write down why this has happened, in their own words.

The final experiment proves that air holds a certain weight.

Experiment 3.) Air has Weight.

- a. Weigh two balloons before and after they are inflated and find the weight.



- b. Tape them to a yard stick.
- c. Balance the yard stick on your finger.
- d. Ask the students why they do this in their own words and record their answers.
- e. Ask them what will happen if one of the balloons is popped and record answers.
- f. Pop one of the balloons with a needle.

Have the students record their answers to all of the questions and discuss the answers at the end of the demonstrations.

**Lesson Relevance to Performance Task and Students:**

This knowledge is applicable for many reasons. Engineers have to account for the weight of air in the construction of building and bridges to make sure that they will be able to hold the loads of air pollution that are exerted on their structures. Likewise they have to know about wind pressures on those same structures to make sure that they do not fall over.

**Anticipatory Set/Capture Interest:**

This lesson will open with the question, "What do the words Solid, Liquid and Gas mean to you?" After receiving the responses of the students you will then ask, "Which of these can you see?", "Which of these can you feel?" and which of these hold weight. If your students are sharp they will say that you can see and feel all three of them at certain times and that they all have weight. This is when you demonstrate the effects of volume through the use of air transfer with a bucket full of water and two beakers. Ask the students, "What is the main factor in a magic trick?" The answer is that you cannot see what is happening. Then ask them, "Out of the three states of matter, which one are you the least likely to see?" This should allow you to be able to lead into the first demonstration.

**Guided Practice:**

Students should come to their own conclusions about what is happening in the experiments and then guided to a final conclusion through discussion with classmates and the teacher.

**Independent Practice:**

No independent practice is to be given to the students.

**Remediation and/or Enrichment:**

Remediation: Follow students IEP.

Enrichment: will come in the form of the following question:

- 1.) Does air hold volume and why?
- 2.) Can air produce pressure and how?
- 3.) Does air weigh anything and why?

## INSPIRE GK12 Lesson Plan



(Try to have them give examples not used in class.)

### **Check(s) for Understanding:**

The checks for understanding will come when the teacher reviews the answers to the questions for remediation and enrichment. The students that understand the concepts and ideas of air will be able to explain what they are thinking and why they think this way.

### **Closure:**

Closure comes toward the end of the class where there is a class wide group discussion of the information covered and the final conclusions that were drawn. There can be a final correct answer or it could be left open ended for more discussion and another lesson.

### **Possible Alternate Subject Integrations:**

Physics, Math

### **Teacher Notes:**

Try and practice the experiments before conducting them in front of the class. Make sure that all materials and handouts are present before class begins.