<table>
<tr><td>Grade: 6</td><td colspan="2">Lesson: Does Air Have Mass?
From FOSS Weather and Water Investigation 2, Part 1</td></tr>
<tr><td colspan="2">Standards:
<u>Middle School – Physical Science:</u>
MS-PS1-7(MA). Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Measure the mass and volume of regular and irregular shaped objects and calculate their density.
MS-ETS2-2(MA). Given a design task, select appropriate materials based on specific properties needed in the construction of a solution.</td><td>SWBAT:
● Use materials to demonstrate that air has mass.
● Record and orally explain the reasons for their data in whatever way is developmentally appropriate.
● Use their data and observations to answer and illustrate the inquiry questions in their notebooks.</td></tr>
<tr><td colspan="2">Inquiry Questions:
● How can we demonstrate that air has mass using these materials?
● How does your investigation demonstrate that air has mass?</td><td>Resources:
● balloons
● straws
● string
● tape
● paper clips
● graphic organizer</td></tr>
<tr><td colspan="3">Lesson/Intro:
● Review with students what happened when air was compressed in the syringe activity. Recall vocabulary compression and pressure, show multimedia demonstrating molecular model of air. Recall definition of mass.
● Ask students: How can we design an investigation that will demonstrate that air has mass? Have students turn and talk.
● Tell students that their challenge will be to demonstrate that air has mass. Explain they will have 5 minutes to explore the materials made available to them and then they will turn and talk and develop their plan. Explain that only after their plans are given final approval can they begin to build.
● As students explore, ask questions like:
o What do you want to find out?
o How does your design show that air has mass?
o What materials will you use?
o How will you do it?
● After 5 minutes of exploration and a second round of discussion, student teams agree upon a design for their investigation. Students each write the plan for their investigation using their own graphic organizer (some students may use iPad/camera/etc). Note: the students who work in teams should each record the same agreed upon plan! Plans should include labels (make word bank/stickies etc available)
● After students have completed the plans, teachers can distribute materials and students can conduct their investigation</td></tr>
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Work Time:
- Students construct their designs and determine if they demonstrate that air has mass
- If students modify their design as they investigate, they must record changes made to the original design (and encouragement to record why the modification was necessary)
- Students continue modifying, testing and recording until they have created a demonstration that illustrates that air has mass

Interventions:
- Suggest a balance beam if no one thinks of it
- For students who need assistance with paper and pencil recording, make an iPad or video camera available
- Guidance on how to stop and record data
- Model recording data for students
- Word bank for materials/ address labels or stickies

Extensions:
- Students can be challenged to find a second way to demonstrate mass.
- Students can be challenged to explain the mass of a helium balloon
- Students record the investigation and observations in their science notebooks (including illustrations and photographs)

Discussion/Closing:
- Have students share their demonstrations. Record demonstrations with a camera or video. Ask students to explain how their model shows air has mass. Encourage other groups to ask questions and provide feedback.
- Ask:
  - *Does the demonstration provide evidence that air has mass?*
  - *Why do you think this is?*
  - *How did you think of this method?*
  - *Analyze the results (discuss pressure, compression, equal weights balanced) and relate this to the particle model of molecules (a balloon with particles of compressed air has more mass than a deflated balloon)*

Assessment:
- Are students working together to be partners in the design process?
- Are students being methodical about recording and labeling their work?
- Are students able to articulate their reasoning for their demonstration?
- Can students articulate their results orally?
- Can students describe how this demonstration provides evidence for their claim?
- Can students use a particulate model of matter to explain that air is matter (and has mass)?

Vocabulary:
- Mass
- Matter
- Compression
- Pressure
- Molecules/Particles
- Materials list
- Volume
- Particulate model
- Equal
- Balance

Technology (optional but provides UDL and ELL support in every classroom):

iPad
stickies
address labels
camera or video camera

Homework:
Reading from Student book, "What's in the Air"

Notes:
The reading should be reviewed in class and the questions answered the next day.