**STEM Lesson - Inversion Aversion!**

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**Fourth Grade**

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| **Text Title**:  Gasping For Air ReadWorks.org  How Does Utah’s Bad Air Hurt our Health?  Winter Time Air Pollution UDAQ | **Grade**: 4th  **Unit Science** |
| **Language Core Standard:**  **RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.  **RI.4.2** Determine the main idea of a text and explain how it is supported by key details; summarize the text. |  |
| **Math Core Standard:**  **OA.3** Dividing Whole Numbers; Division Issues and Word Problems  **OA 1-3** Equations and Word Problems – Reasoning and Solving Problems; Comparison Word Problems; |  |
| **Science Core Objective**:  ILO-1. Use Science Process and Thinking Skills   * a. Observe simple objects and patterns and report their observations. * b. Sort and sequence data according to a given criterion. * c. Make simple predictions and inferences based upon observations. * d. Compare things and events. * e. Use instruments to measure length, temperature, volume, and weight using appropriate   STANDARD II: Students will understand that the elements of weather can be observed,measured, and recorded to make predictions and determine simple weather patterns.   * units. * f. Conduct a simple investigation when given directions. * g. Develop and use simple classification systems. * h. Use observations to construct a reasonable explanation.   Objective 1: Observe, measure, and record the basic elements of weather.  Objective 2: Interpret recorded weather data for simple patterns.  Objective 3: Evaluate weather predictions based upon observational data. | **Vocabulary**:  **air pollution** - substances in the air that make it unsafe and not suitable to use.  **convection current**: the movement of air due to temperature differences.  **temperature inversion**: when an upper thick layer of warm air traps a lower layer of cold air close to the Earth, causing the temperature to be warmer at higher elevations. |
| **Engineering Connection**   * Engineers study temperature inversions and convection currents to understand why pollution levels may be higher in some areas than in others. They use this information to reduce pollution levels and determine new pollution prevention programs. They also study convection currents inside buildings to help improve indoor air quality that may be poor due to smoking or fumes from cleaning supplies. Convection currents help to circulate these pollutants, sending them outside of the building. |  |
| **Reading Instruction** |  |
| **Close Reading Lesson**   1. Introduce close reading by telling the students that today they are going to dig deeper into their reading in order to better comprehend. 2. Give the text Gasping For Air (available on Read Works.org) to the students. Ask them to read the text. Tell them to try to think what the text is mostly about. 3. Let them discuss what the purpose of the text is with their partner. 4. Have the students read the text again, this time tell them to underline the topic sentence in each paragraph with a red pencil and circle 3 to 5 keywords in each paragraph. 5. Show the students the questions from the text:    1. What is asthma?    2. What is the cause of asthma?    3. Why don’t doctors think kids should play outside on certain days?   6. Now, have the students go back and reread the text again, looking for evidence that will help them answer the questions.  7. Have the students write what the main idea of the text is. |  |
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| **Writing Instruction** |  |
| 1. After a discussion about air pollution as well as the science demonstration, have a class discussion about the problems with pollution and inversions. Let the students write an informative writing piece in order to help others understand the problem as well as their own solutions. 2. Let the students design a campaign against pollution. 3. Invite the students to create a badge for their campaign. | Materials: Badges from the ISC. |
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| **Integration** |
| **SCIENCE/Technology** |
| **Summary**: Students develop their understanding of temperature inversions by constructing and observing a simple model.  **Learning Objective**: Build simple models to investigate temperature inversions.  Understand how engineers study temperature inversions and convection currents to know why pollution levels may be higher in some areas than in others.  Materials List:   * empty two-liter plastic bottle * balloons * large bowl * hot water * ice   Procedure:  Lead a brainstorming session with the question: What is a temperature inversion? Encourage ideas and write them on the board. Tell students they will learn more about this topic during the activity.  Step 1: Fit the mouth of the balloon over the mouth of the empty, two-liter bottle.  Step 2: Stand the bottle in the center of the bowl. Fill the bowl with hot water, around the outside of the two-liter bottle.  Step 3: After a few minutes, notice the ballon start to inflate.  Step 4: Carefully pour the water out of the bowl and fill the bowl with ice. What happens?  Step 5: Ask students why the balloon inflated and deflated in response to the hot and cold water.  Explanation: When air is warmed, it expands and needs more space, so it stretches out the balloon. When air is cooled, it contracts and needs less space, so the balloon deflates. In this closed system, the mass of air in the bottle remains constant, so this shows that the warm air requires more space (and thus is less dense, based on the fact that density=mass/volume) than the cool air. Warm air rises because it is less dense than cold air. |
| **MATH** |
| Using the text, *Gasping for Air,* practice dividing whole numbers, writing equations and solving word problems.  1. Draw a fraction bar to show the number of kids in the study who lived in polluted air and those who lived in fresh air.  2. Write a situation equation to find the number of students who didn’t develop asthma compared to those who did not.  3. If 3,500 kids were used for the study, how many were in each group? |