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| **Lesson Title** | Layers of the Atmosphere |
| **Length of Lesson** | 50 minutes |
| **Created By** | Claire Babineaux |
| **Subject** | General Science |
| **Grade Level** | 8th |
| **State Standards** | 3.e, 4.c |
| **DOK Level** | 2 |
| **DOK Application** | Compare, Classify, Distinguish, Interpret, Make Observations, Identify Patterns |
| **National Standards** | C: Life Science<br>D: Earth and Space Science |
| **Graduate Research Element** | Although the atmosphere and clouds do not directly relate to the research of Sand and sediment analysis to determine the feasibility of using recycled glass for beach replenishment, the ideas and principles associated with this lesson are used in the context of my studies. For example, my research takes place on the beach which are affected by the tides which is in turn related to the climate and gravity. |

**Student Learning Goal:**
The students will learn about the layers of the atmosphere to follow up on the idea of the earth as a system or a series of systems. The students will learn the characteristics of the different layers. They will then use this information to fill in a chart and label the layers of the atmosphere. Also, the students will learn about the types of clouds and where they can be located within the atmosphere.

State Standards:
3. Compare and contrast the structure and functions of the cell, levels of organization of living things, basis of heredity, and adaptations that explain variations in populations.

- E: Explain energy flow in a specified ecosystem. (DOK 2)
  - Populations, communities, and habitats
  - Niches, ecosystems and biomes
  - Producers, consumers and decomposers in an ecosystem

4. Describe the Earth's System in terms of its position to objects in the universe, structure and composition, climate, and renewable and nonrenewable resources.

- C: Examine weather forecasting and describe how meteorologists use atmospheric features and technology to predict the weather. (DOK 2)
  - Temperature, precipitation, wind (speed/direction), dew point, relative humidity, and barometric pressure

• How the thermal energy transferred to the air results in vertical and horizontal movement of air masses, Coriolis effect
• Global wind patterns (e.g., trade winds, westerlies, jet streams)
• Satellites and computer modeling

National Standards:

C: Life Science

- Populations and Ecosystems
  - A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. *All of the living organisms and ecosystems on Earth are located in the Troposphere.*

D: Earth and Space Science

- Structure of the Earth System
  - The solid earth is layered with a lithosphere; hot convecting mantle; and dense, metallic core. *The earth's atmosphere is also layered.*
  - The atmosphere is a mixture of nitrogen, oxygen and trace gases that include water vapor. The atmosphere has different properties at different elevations.
  - Clouds formed by the condensation of water vapor, affect the weather and climate.
  - Global patterns of atmospheric movement influence local weather. Oceans have a major effect on the climate, because water in the oceans hold a large amount of heat.

**Materials Needed (supplies, hand-outs, resources):**
PowerPoint presentation, Atmospheric layers worksheet, clouds worksheet, flipchart activity

**Lesson Performance Task/Assessment:**
Students should be able to describe the atmosphere in layers. They should be able to identify the types of clouds and be able to locate where they would occur in the atmosphere.

**Lesson Relevance to Performance Task and Students:**
Students should be able to describe the different layers of the atmosphere by knowing the characteristics of the layers. They should understand within which layers the different types of clouds form. They will also make a flipchart of the layers of the atmosphere.

**Anticipatory Set/Capture Interest:**
To capture the interest of the students, the teacher can show them pictures of the Aurora Borealis, more commonly known as the Northern Lights. A few facts include:

- a natural light display in the sky particularly in the high latitude (Arctic and Antarctic) regions, caused by the collision of energetic charged particles with atoms in the high altitude atmosphere (thermosphere).
- In the northern latitudes, the effect is known as the ***aurora borealis*** (or the **northern lights**), named after the Roman goddess of dawn, Aurora, and the Greek name for the north wind, Boreas, by Pierre Gassendi in 1621.
- The aurora borealis most often occurs near the equinoxes.
- Auroras seen near the magnetic pole may be high overhead, but from farther away, they illuminate the northern horizon as a greenish glow or sometimes a faint red, as if the Sun were rising from an unusual direction.
- Its southern counterpart, the ***aurora australis*** (or the **southern lights**), has almost identical features to the ***aurora borealis*** and changes simultaneously with changes in the northern auroral zone and is visible from high southern latitudes in Antarctica, South America and Australia.

An interesting fact to mention would be that the Northern Lights have been seen as far south as Mississippi this year.

**Guided Practice:**
First and foremost, the teacher should give the students a recap of what was covered previously dealing with the atmosphere. It will be useful for them to understand that the Earth is composed of layers and systems. They should understand that the layers go from the inner core all the way to the outer layers of the atmosphere.

The teacher should secondly go over the directions for the atmosphere layers flipchart (See Teacher's Notes). The students will fill in their flipchart with information from the PowerPoint lecture. The teacher will guide them through the directions on how to assemble the flipchart but the teacher has the option to have them complete the chart while the lecture is taking place or for independent practice.
The flipchart will help the students to understand the layers of the atmosphere both spatially and comprehensively. The flipchart will also give them access to a way to help them study.

**Independent Practice:**
For independent practice, the students should fill in their assembled flipchart if the teacher chose to not have them fill it in as the PowerPoint lecture was being presented. Also, the students will complete a series of worksheets focusing on the layers of the atmosphere, characteristics of these layers, the types of clouds, and where these clouds can be located within the layers. If the students do not complete the worksheets, it may be necessary for them to complete it for homework.

**Remediation and/or Enrichment:**

Remediation: individual IEP supported; the teacher may partner u the students and have the partner help throughout the lesson; the teacher can observe the students and intervene during the independent practice.
Enrichment: extend the lesson

**Check(s) for Understanding:**
Based on this lesson, the students will have an understanding of this information if they can answer the following questions:

- What are the layers of the atmosphere? How are they characterized?
- Look outside. Describe the weather. What types of clouds do you see?
- What is the Aurora Borealis? Where can it be seen? Where is it located?

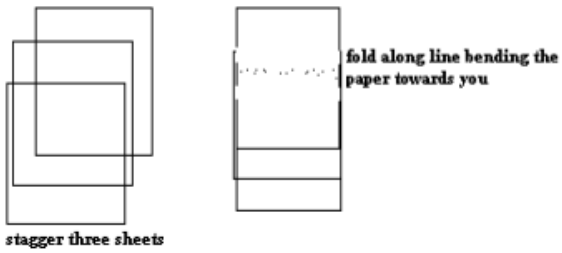
**Closure:**
The teacher can close with a discussion about the characteristics of the different atmospheric layers. The teacher can also lead a discussion based on the layers of the atmosphere and pollution.

**Possible Alternate Subject Integrations:**
Math: reading and interpretation of graphs associated with the temperature and depth of the atmospheric layers.
Physics: Calculating the speed of light and sound through the different layers.
History: the history of meteorology and how the discovery of the atmospheric layers came about; the name derivation of Aurora Borealis

**Teacher Notes:**
Link for a website showing the layers of the atmosphere:
http://www.robbinsville.k12.nj.us/4431_12582512397/lib/4431_12582512397/Layers_of_atmosphere_class_activity.pdf

Directions for the Layers Flipchart:

1. Take three sheets of typing paper and stagger them, then fold down the top so that you have six flaps or folds, staple across the top.



2. On the right from bottom to top he needs to label the four main layers (troposphere, stratosphere, mesosphere, and thermosphere; The two small layers are within the troposphere (ionosphere and exosphere to go on the left)

The foldable should include this other information:

- kilometers from earth
- definition of each layer
- pictures of whatever exists in that layer

Color all of it very beautifully.

Make sure that your handwriting is clear and nicely written

The end product should look something like this: