ASTROEDU

Peer-reviewed Astronomy Education Activities

How High is the Sky?

Explore layers of Earth's atmosphere.

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AGE

6 - 12

LEVEL

Primary

TIME

1h

GROUP

Group

SUPERVISED

No

COST PER STUDENT

Low Cost

LOCATION

Small Indoor Setting (e.g. classroom)

CONTENT AREA FOCUS

Earth Science

EARTH SCIENCE KEYWORDS

Atmospheric Sciences

CORE SKILLS

Asking questions, Communicating information

TYPE(S) OF LEARNING ACTIVITY

Modelling, Simulation focussed, Fun activity

KEYWORDS

Layers of the atmosphere, Boundary of space

GOALS

For students to understand where the boundary between our atmosphere and outer space is.

LEARNING OBJECTIVES

At the end of this module, students should be able to:
- Know the importance of the atmosphere
- Identify the different layers of the atmosphere
- Describe the characteristics of each layer
- Define the boundary between the Earth and outer space

EVALUATION

Ask the class: From the ground up, what are the different layers of the atmosphere? What common objects can be found or events that happen in that layer? (This could be created as a multiple choice quiz on socrative: https://itunes.apple.com/au/app/teacher-clicker-socrative/id477620120?mt=8).

Ask students to raise hands to vote in which layer of the atmosphere is the boundary between Earth and outer space found? Why? (Answer: The thermosphere, because as height above the ground increases, the amount of air gradually decreases. This is the official maximum height, 100 km above sea level).

In groups, ask students to think of ideas for why do we need the atmosphere? Discuss these as a class and draw a spider diagram on the board.
Ask the class, do we want to look after the atmosphere? In groups, ask students to think of ways for how they can help protect and preserve the atmosphere? These ideas can be discussed as a class and a spider diagram drawn on the board. Alternatively, as an extension activity, ask students to produce a poster on how they can protect the atmosphere.

MATERIALS

- Cylindrical container
- Salt
- Food colour

- Plastic bags
- Plastic spoon
- Newspaper

BACKGROUND INFORMATION

We live on the Earth's surface which is below many layers of air we call the atmosphere. The atmosphere is very important to almost all life forms, including humans, because:

- It contains the air that we breathe
- It acts as a blanket that makes our planet warm enough
- It protects us from dangerous radiation, like UV rays from the Sun
- It also acts as a shield that prevents meteors from hitting the Earth.

Scientists studying the atmosphere divided it into five major layers. From the ground upwards, these are:
- Troposphere the lowest layer and is closest to the ground or sea level. This is where we live and also where birds and airplanes fly. This is where we see clouds form and weather happens.
- Stratosphere is the layer of the atmosphere above the stratosphere where it extends at a height of 50 km from the ground. It contains the ozone layer which absorbs most harmful radiation from the Sun.
- Mesosphere is the next layer above the stratosphere. It covers a height of 80 km from the Earth's surface. This is where we see meteors burn up in the sky. Not only that, the coldest place on Earth is at the top of the mesosphere.
- Thermosphere is the next layer below the exosphere where air is very thin. The space station and some satellites are located here. Within the thermosphere, the Karman line is at a height of 100 km above the ground which serves as the boundary between the Earth's atmosphere and outer space.
- Exosphere is the topmost or outermost layer. It goes all the way up to 10,000 km above the Earth's surface.

FULL ACTIVITY DESCRIPTION

Group Activity: Making a model of the layers of the atmosphere.

Procedure:

WARNING: NEVER PLAY WITH FOOD COLORS because they can stain your uniform! Listen always to your teacher's instructions and ask for help if you are having difficulty in doing the activity. Clean up your workplace afterwards.

1) Use the newspaper to protect your work surface. From the bottom of the bottle, measure and mark the heights 1 cm, 2 cm, 4 cm, and 15 cm using the ruler and marker.

2) Make the bottom layer, the troposphere, first and proceed upwards. Pour the exact drops of liquid food colour (given in the table below) into the plastic ice bag. For example, use 2 drops of blue for the troposphere.

Table 1:
Amount of salt and food colour corresponding to the layer of the atmosphere in the model.

Layer	Amount of salt (tablespoon)	Food Colour	Amount of food colour (drop)
Troposphere	2	Blue	2
Stratosphere	2	Red	3
Mesosphere	5	Green	7
Thermosphere	28	Yellow	18
Exosphere	10	Blue	3

3) Using another ice bag, pour exact number of tablespoons of salt. For example, 2 tbsp of salt for the troposphere. Then, transfer the salt into the other ice bag containing the food colour.

4) Inflate the plastic by blowing air, and then shake vigorously for about 30 seconds to distribute the colour evenly.

5) Carefully pour the coloured salt into the bottle.

6) Make the layer compact by using the foam stick. Make sure the layer will not exceed the indicated mark. Do not to shake the bottle after so that colours will not merge.

7) Repeat the steps 2 to 4 until you reach the exosphere. Fill to the very top of the bottle so that the layers won't move around. Place the lid onto the bottle.

8) Given the printed stick-on materials (e.g. airplane, clouds, lightning, weather balloon, satellite, etc.), attach them on the bottle opposite the layer where that object can be found.

9) Using the marker, draw a line around the bottle to indicate where the Karman line is found.

CURRICULUM

Country | Level | Subject | Exam Board | Section
— | — | — | —
UK | KS3 | Chemistry | - | Earth and Atmosphere

ADDITIONAL INFORMATION

CONCLUSION

In the end, the students should have an understanding that we live only on a very small portion of the atmosphere. In addition, they should understand that outer space is considered to be at 100 km above sea level.

CITATION

Sese, R., 2013, *How High is the Sky?*, astroEDU, doi:10.11588/astroedu.2013.1.81221