LESSON PLAN

CREATED FOR TEACHERS BY EDEN'S EDUCATION TEAM

The Weather Maker – Teacher Guide

Curriculum links
The Weather Maker experience will help teachers cover the following aspects of the KS3 and KS4 Science curriculum: photosynthesis, transpiration, climate change, the carbon cycle, the water cycle, interdependence and working scientifically.

What to do
Access the Invisible Rainforest and then click on 'Weather Maker (KS3/KS4)' to begin. You will be taken to a 360-degree aerial view of the Rainforest Biome. From this view you can pan the camera in any direction, zoom in and out, and toggle the sound on and off. You will see there are two buttons to pick from, 'Weather Maker' and 'Rainforest Dashboard'

Weather Maker

Learning Outcomes

- Explain the key biological plant processes of 'photosynthesis' and 'transpiration' and consider them in the context of their role in the global carbon and water cycles.

What to do
With the students, explore the view of West Africa and the Oil Nut Tree. Read the introductory text that precedes the Weather Maker clip. Explain to the students that they are about to see a video clip designed to help them visualise the plant processes of photosynthesis and transpiration and put them into context with the global carbon and water cycles. To aid their understanding, highlight that the white particles represent oxygen molecules, the blue particles represent water molecules and the orange particles represent carbon (as carbon dioxide or carbon contained within sugars in the plant).

Give the students the question sheet (The Weather Maker student sheet) and ask them to record the answers to the questions while the clip plays.

Press play. As the clip plays, you are able to pan the camera to look around to help the students see what they need to see in order to answer the questions.

After the clip finishes, facilitate a class discussion so that the students can share the answers to the questions and clarify their understanding.

LESSON PLAN

CREATED FOR TEACHERS BY EDEN'S EDUCATION TEAM

Rainforest Dashboard

Learning Outcomes:

- Discuss the role that rainforests play in the generation of weather and regulation of our climate, as well as how climate change is impacting on rainforests.
- Analyse data from a rainforest and suggest reasons for changes in parameters such as photosynthetic rate over a 24-hour period.

What to do: Infographic

Following on from the Weather Maker, explain to the students that it's important to remember that whilst vital for the plant itself, these processes of photosynthesis and transpiration have a role in influencing the Earth's weather patterns and climate. They aren't just things that happen inside the plant; it's also about how those things connect to the global cycles.

Give the students time for a short discussion and then ask them to suggest any ways that they think plants processes link to larger global cycles. Share the infographic with the students and work your way around the buttons to highlight six examples of how these plant processes link to the global carbon cycle and the water cycle. You may need to remind the students of the role carbon dioxide plays in climate change to help them appreciate the importance of rainforests as 'Carbon Catchers' and 'Carbon Storers'. This video clip can help you to do that.

Rainforests certainly affect climate, but the opposite is also true; climate affects rainforest. Click on the red banner to discover 3 ways that climate change is already affecting the rainforest.

What to do: 24HR Graph

Note: This activity will help students practice the 'Working Scientifically' area of the curriculum. In particular Interpretation of data and presenting reasoned explanations.

Share the 24HR Graph with the students. Explain that the graph is showing how various parameters change over a 24-hour period (from midnight - midnight) in a Tropical Rainforest (light, relative humidity, temperature, rate of photosynthesis, respiration rate).

Explain to the students that you are going to use the toggles to remove certain lines from the graph and give them some questions to consider.

LESSON PLAN

CREATED FOR TEACHERS BY EDEN'S EDUCATION TEAM

Turn the toggles on for light and rate of photosynthesis only

Question 1: What is the relationship between light levels and photosynthesis? Can you explain it?

Answer: In simple terms, light is required for photosynthesis and so the rate of photosynthesis rises and falls with light intensity.

Turn the toggles on for rate of photosynthesis, rate of respiration.

Question 2: Why does photosynthesis drops to zero during the night but respiration continues?

Answer: Light is not required for respiration. Remember, the purpose of photosynthesis is to make the plant it's food (glucose). Respiration is the process through which energy is released from glucose in the cells of all living things (plants and animals).

Turn toggles on for light, photosynthesis, temperature, relative humidity.

Question 3: Why does photosynthesis plateau (level off) in the middle of the day?

Answer: As we know (from question 1), you need light for photosynthesis. The lines for light and photosynthesis, show that the light levels are still rising (the yellow line) when the rate of photosynthesis is starting to level off (the green line). This indicates that something else is limiting the rate of photosynthesis other than the light intensity.

The lines for temperature and humidity might provide the answer. At the same time as the rate of photosynthesis is levelling off (the green line) the air temperature is going up and the humidity is going down. This means that the air is getting hotter and dryer. The effect of this is an increase in the rates of transpiration from the leaves. The plants will start losing dangerous amounts of water. In order to protect themselves from drying out, the leaves partially close their stomata (microscopic holes in the leaves) to reduce this water loss. The flip side of this is that it means less carbon dioxide can get into the leaf. Carbon dioxide is needed for photosynthesis, so as a result of this, the rate of photosynthesis is limited.

Extension: Teachers and students could discuss and suggest questions of their own about the changes in the parameters on the graph. In addition, they could also suggest how they think Carbon dioxide and Oxygen levels would change over the 24hr period.