What's Tipping your Carbon Balance?

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I.Introduction

Learning Objectives: For my speech I will be focusing on the carbon cycle and its effect on the environment. The Carbon cycle pertains to the sixth grade level SoL but also continues in depth up to tenth grade. Throughout high school the SoL ties everything one learned of the carbon cycle and the importance of elements, and transforms it into the ecosystem and relations with the environment. Photosynthesis, respiration, and combustion make up the leading forces of CO2 interactions. For the last segment I will be going over the anthropogenic impacts, and the importance of understand Greenhouse Gases.

A. My name is Marrina Nation, Hometown- Oceanside, CA, Major- Environmental Science with an option in Life Science and a minor in Biology, I Currently attend California State Univeristy East Bay. I had the opportunity this past summer to intern as a PINEMAP undergraduate fellow.

B. What is PINEMAP?

PINEMAP stands for: Pine Integrated Network: Education, Mitigation, and Adaptation Project. This is a very large research project funded in 2011 by the USDA. It involves 11 universities, several government agencies and dozens of scientists.

Scientists come from the areas of biology, modeling, genetics, economics, policy, education, and outreach. I am here today as part of the education program, and this summer I worked as a researcher in the silviculture/ ecophysiology area at Virginia Commonwealth University Rice Center.

PINEMAP's overall goal is enable southern pine landowners to

- manage forests to increase carbon sequestration by 15% by 2030;
- increase efficiency of nitrogen and other fertilizer inputs by 10% by 2030;
- adapt forest management approaches and plant improved tree varieties to increase forest resilience and sustainability under variable climates…

…which brings me to my presentation today. I am going to talk about the carbon cycle and the importance of carbon sequestration in restored wetlands.

C. Role of Carbon in the atmosphere: related to the SoL's of grades six through twelve

1. What is Carbon? (All grades)
    a) The Carbon cycle (All grades)
    b) Source or Sink?
2. Photosynthesis: Respiration (Grade nine and up)
3. Stability in an Ecosystem (Grade 10 and up)
4. Anthropogenic Impacts (All grades)

II.First Main Point: What is Carbon?

A. Carbon is the 15th most abundant element in the Earth's crust, and the fourth most abundant element in the universe by mass after hydrogen, helium, and oxygen. It is present in all known life forms, and in the human body carbon is the second most abundant element by mass. Photosynthesis, respiration, and combustion are the driving force as to how much CO2 is in the atmosphere. The equations are nearly the same except for the opposite directions that drives the concentration of CO2.

1. The Carbon Cycle:
    a) Where is carbon cycled
        (1) Atmosphere
        (2) Terrestrial
        (3) Ocean
    b) Example of carbon cycle
        (1) During photosynthesis, plants absorb carbon dioxide and sunlight to create glucose and other sugars
        (2) Carbon chain of CO2 breaks apart where stored energy stored from bonding of carbon chain is released.
        (3) Equations:
            (a) photosynthesis- $CO_2+H_2O \rightarrow C_6H_{12}O_6+O_2$
            (b) Respiration- $C_6H_{12}O_6 +O_2 \rightarrow CO_2+H_2O+ATP$

            (c)Combustion- $C_6H_{12}O_6 +O_2 \rightarrow CO_2+H_2O+Heat$

        *(4) **<u>Glucose from photosynthesis stored, transported or oxidized; very important to note that plants respire too</u>.*
2. Source vs. Sink
    a) Carbon Source: Processes that release CO2 to the atmosphere
        (1) Fires, Volcanoes, Decomposition, Digestion, Respiration
    b) Carbon Sinks (Carbon Sequestration): Absorbs more carbon than it gives off
        (1) Oceans, Forest, Photosynethesis, Carbonate rocks, Decomposers/ dentitus (consumes dead organic matter)

III.Second Main Point: Photosynthesis, Respiration, and Combustion

A. The important aspects of photosynthesis and respiration pertaining to carbon, and the carbon cycle

1. How does photosynthesis work
    a) Carbon Dioxide + Water + Light ----> Sugar + Oxygen
2. How does respiration work

    a) Humans and animals do the exact opposite of photosynthesis. They breathe in oxygen and breathe out carbon dioxide. This means that we give plants more carbon dioxide, and they give us more oxygen. Without plants we wouldn't be able to survive, but there is enough carbon dioxide in the atmosphere that plants would still exist without us!

IV.Third Main Point: Stability in an Ecosystem

A. This section of the presentation can focus on the importance of ecosystem stability, and the roles of carbon in each case.

1. Sensitive ecosystems
    a) Where is carbon beneficial or destructive?
        (1) Atmosphere: CO2 is considered a greenhouse gas, which means that the atmosphere is warming with the increasing amounts of CO2 being released into the atmosphere.
        (2) Terrestrial: Considered a carbon reservoir due to the soils and woods that store carbon for long periods of time. How will the terrestrial biosphere respond to global warming, and how will it feed back into the climate?
        (3) Ocean: Carbon moves in and out of the ocean daily, but is also stored there for thousands of years. (ex) Phytoplankton use carbon and turn it into organic matter.

V.Fourth Main Point: Anthropogenic Impact

A. Going over impacts that are changing the environment.

1. Human Impact
    a) Energy Industries
    b) Effects on Biodiversity

VI.Conclusion

A. Restate your main points

1. What is Carbon? (All grades)
    a) The Carbon cycle (All grades)
    b) Source or Sink?
2. Photosynthesis: Respiration (Grade nine and up)
3. Stability in an Ecosystem (Grade 10 and up)
4. Anthropogenic Impacts (All grades)

B. Summarize these ideas, and get the class interacting with the presentation

C. Interactive activities depending on grade level

1. Detecting CO2 gas with a short experiment using baking soda and vinegar and BTB (6^{th} to 8^{th} graders)
    a) Find out with the experiment which are sources of CO2 : plants, animals, and fossil fuels.
2. True or False: "Are you a Carbon Connoisseur?" Test their knowledge on carbon (9^{th} to 12^{th} graders biology classes)
3. Take tree cores and measure with DBH tape to examine and prove how old the trees on campus are, and how much carbon they hold. (All grades)
4. Students are carbon atoms moving through the carbon cycle at seven different stations around the room, and the dice is used to indicate where and when the student will move. (6^{th} to 10^{th} graders)
5. Carbon cycle role-play: An indoor game if not able to go outside