TGC Fellow Unit Template *

Prepared by: Leslie Blaha | School/Location: Montgomery Blair High School, Silver Spring, MD

Subject: Science | Grade: 10-12 | Unit Title: Global Climate Change | Time Needed: 3 weeks

Unit Summary: Students will be learning about the carbon cycle, sources of carbon in the atmosphere, and the greenhouse effect. They will be using data on carbon levels around the world. They will analyze the effect of climate change on the ecology of two different ecosystems, one in a developed country, and one in a developing country. They will work together to design a solution that will help mitigate the effects of climate change on both human and non-human populations.

Stage 1 Desired Results

ESTABLISHED GOALS:

G1.
Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

G2.
Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

G3.
Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

GLOBAL COMPETENCY:

G4.
Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Transfer

Students will be able to independently use their learning to…(real world purpose)

T1. Investigate the world beyond their immediate environment
T2. Take action to improve conditions
T3. Recognize perspectives

Meaning

UNDERSTANDINGS *Students will understand that…*	ESSENTIAL QUESTIONS
U1. Humans have a huge impact on the environment U2. Climate change is a global problem U3. Preparing for the effects of climate change requires knowledge of public policy as well as scientific content	E1. What human activities lead to an increased rate of climate change? E2. What long term effects will climate change have on non-human ecosystems and human civilizations?

Acquisition

Students will know… (Content)	*Students will be able to… (Skills)*
K1. How carbon cycles through the ecosystem K2. How carbon dioxide traps heat on earth K3. How changes in abiotic conditions affect biotic factors within the ecosystem	S1. Interpret data about carbon levels around the world S2. Communicate ideas for decreasing the amount of carbon released into the atmosphere S3. Analyze claims about the effects of climate change

Stage 2 - Evidence	
Assessment	**Evaluation Criteria (Learning Target or Student Will Be Able To)**
Assessments **FOR** Learning: (ex: kwl chart, exit ticket, observation, draft, rehearsal) • KWL chart: Climate Change • Literature Review: climate change research, news articles • Lab: carbon cycle, ocean acidification, photosynthesis • Classwork: carbon cycle video poster, carbon data analysis	1. Growth of knowledge on KWL chart 2. Thorough and accurate reading comprehension of articles 3. Demonstrated knowledge of the carbon cycle and how carbon contributes to global warming 4. Detailed and informative explanation of the effects of climate change on several ecosystems 5. Analysis of data sets
Assessment **OF** Learning: (ex: performance task, project, final paper) Poster of how climate change connects to the entire year's curriculum: 1) its effects on a particular organism 2) evolutionary impact of climate change 3) explanation of the ecosystem changes on biodiversity 4) carbon's role in climate change Presentation to the UNEP to help people make informed decisions about climate change.	Evolution • Natural selection (select for species that can tolerate changing environment) • Lack of adaptations (i.e. polar bears, California sea lions) • Extinction of species Ecology • Abiotic and biotic factors changing the ecosystem (temperature, rainfall, acid, disease, etc) • Biodiversity (impact of climate change on biodiversity, positive and negative effects on biodiversity) • Human impact on ecosystem (deforestation, invasive species, pollution, etc) • Graph/data on population of their organism Energetics • Steps of the carbon cycle • Comparing rates of photosynthesis and carbon dioxide production • Explain how carbon dioxide levels cause global warming **UNEP Presentation** Political solution – an explanation of the solution, how it will help alleviate climate change, impact on organism/ecosystem Personal solution – an explanation of the solution, how it will help alleviate climate change, impact on organism/ecosystem

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction (Make this a useful outline or summary of your unit, your daily lesson plans will be separate)

Week One: Students will explore aspects of various ecosystems – abiotic/biotic factors, succession, and food chains/webs

Week Two: Students will understand the connection between living organisms and the importance of biodiversity on the ecosystem as well as human society. They will evaluate how human activities disrupt natural ecosystems and the impact this disruption has on biodiversity.

Week Three: Students will explore how energy flows through organisms and their environment, with a specific focus on the carbon cycle. This week will include labs and activities on photosynthesis and respiration

Week Four: Students will connect the natural carbon cycle to human activities, global warming, and climate change. They will collect and analyze global data on carbon levels and evidence of climate change from the perspective of Earth's existence as well as since the Industrial Revolution.

Week Five: Students will create their posters and design their UNEP presentation.

**adapted from Understanding by Design Model*

TGC FELLOWS UBD Lesson Template

Lesson Title: Ecosystems Introduction Subject: Biology Prepared by: Leslie Blaha

Materials Needed: Internet, Circle of Life identification cards, various worksheets

Global Competency: Students use science to investigate the world.

Where is the lesson going? (Learning Target or SWBAT)	Students will be able to identify and analyze the connection between living organisms and their environment through the use of a food web.

Hook:

As students come into the room, they will be given a card to hang around their necks. Each card will have the name of an organism from "The Lion King." They will watch "Circle of Life" from the Disney movie and then create food chains, a food web, and an energy pyramid with themselves as the organisms. They will then analyze what happens to the ecosystem when one organism goes extinct and brainstorm about various reasons for why an organism may become endangered or extinct.

Equip:

Students will use the website http://concord.org/activities/experiment-ecosystems to explore food chains and model the impact of ecosystem changes on the organisms living there.

Rethink and revise:

Students will watch "Colors of the Wind" from Pocahontas and identify abiotic and biotic factors within the forest ecosystem. They will also analyze the deeper meaning of the song and brainstorm about the effect humans have on their environment. They will also compare respectful ways of living within the environment with habits and practices that produce harmful, long-term effects on the ecosystem.

Evaluate:

Students will identify an invasive species, map where it came from and where it has invaded. They will then choose and read an article about invasive species and analyze the effect of the introduction of that organism on the native ecosystem.

Notes:

Tailored Differentiation:

The cards are color coded according to niche (green for producer, yellow for herbivores, orange and pink for omnivores and carnivores). Depending on background knowledge, students can discover this on their own, or I can tell them what the colors mean and they can use them to build the energy pyramid.

Students will be able to choose an article on an invasive species based on their reading level. Newsela has several articles on this topic that can be adjusted to various reading levels and even translated into different languages (Spanish, at least).

Organization:

Reserve Chromebooks, have differentiated articles available for students