Lesson Title	Green for Ghana
Length of Lesson	One (50 minute) class period
Created By	Calista Guthrie
Subject	Earth Science
Grade Level	7^{th} grade
State Standards	7^{th}: 1h (Inquiry); 3a (Life Sciences); 4c (Earth Science)
DOK Level	DOK2
DOK Application	Construct, Predict, Interpret, Cause/Effect, Context Clues, Compare, Relate
National Standards	5-8: A (Inquiry); C (Life Sciences); D (Earth/Space)
Graduate Research Element	Stagnant waters produce toxic hydrogen sulfide. Looking at climate change on a global scale, if ocean conveyor shuts down the whole ocean could become a big stagnant puddle producing H_2S.

Student Learning Goal:

MS 7th Grade:

1(h) Make the connection between evident changes Ghana and climate change as an explanation. 3(a) Discuss how the people of Ghana are changing where/when they plant crops and get water. Also, they will get a little bit on land biomes. 4(c) Students will learn how heat transfer and movement of air masses controls the climate in Ghana.

National Science Education Standards of Content 5-8:

A: Inquiry: Think critically and logical to make the relationships between evidence and explanations; Students will see evidence of change in Ghana that can be explained by a shift in climate.

C: Life Science: Regulation and Behavior; Changing environment in Ghana forces people to adapt to shift in resources.

D: Earth and Space Science: Structure of the Earth System; Patterns of Air Movement affect Ghana. Earth in the Solar System; Seasons due to the tilt of Earth's rotation on it's axis as it revolves around the sun.

F: Science in Personal and Social Perspectives: Natural Hazards; Human contributions to change in Ghana in regards to desertification.

Materials Needed (supplies, hand-outs, resources):

Red, Yellow, Green, and Black yarn, bracelet instructions (see Teacher Notes)
Globe (preferably in a stand where it is tilted) with a marker on Ghana, something to represent the sun, PowerPoint (INSPIRE_Guthrie_02.15.12_GreenforGhana)

Lesson Performance Task/Assessment:

The bulk of the class will be focused on the PowerPoint and understanding the cause of wet and dry seasons in Ghana, Hadley Cells, and effects of climate change in Ghana. Use the tilted globe and sun to show where Ghana is during wet and dry seasons so that students can make the relationship of where the sun is heating Earth's surface most and how that will effect winds and thus the seasons of Ghana. As a reminder of Ghana, students will end class by making bracelets with the colors of the Ghanaian flag.

Lesson Relevance to Performance Task and Students:
The capture activity for this lesson is making bracelets at the end of class. Through the lecture students will learn about the people of Ghana and the challenges they face as a result of climate change. It should be pointed out that Africa has the lowest greenhouse gas emissions of populated areas around the world, however, it is the people of Africa that are seeing severe effects of climate change. Students will develop an appreciation for the people of Ghana and will make bracelets to remind them to be "green" for Ghana.

Anticipatory Set/Capture Interest:
The initial capture of this lesson will be discussing Ghana's performance in the World Cup 2010 and what that meant to not only the people of Ghana, but to all of Africa. W.E.B Du Bois' contributions to African American advancement and high regard for Ghana should also be mentioned. As lecture proceeds into climate in Ghana the instructor should give the students opportunities to be interactive in the lecture by allowing them to answer and ask questions.

Guided Practice:
Students will listen and interact throughout the lecture. The instructor should check regularly for understanding. The last 20 minutes of class students will be given yarn and instructed on how to make bracelets (see Teacher Notes for sample instructions).

Independent Practice:
Students will be expected to react to the information presented them by asking questions and displaying understanding.

Remediation and/or Enrichment:
Remediation – Have students draw Hadley cells themselves as well as drawing where the Earth is in reference to the sun during rainy season and during dry season in Ghana.

Enrichment- Discuss how Hadley cells are influenced by coriolis. Coriolis affect can be demonstrated using a turn table and a ruler. Why one student turns the table the other student attempts to draw a straight line from the center of the table to the outside. A curved line results demonstrating deflection of air that makes the trade winds and keeps Hadley cells moving.

Check(s) for Understanding:

Allow students to interject during lectures with questions and comments. The instructor should present questions throughout the lecture to check for understanding.

Closure:
Seasonal festivals and hand crafted jewelry will be mentioned in the closing of lecture leading into the students making bracelets as a reminder to be green for Ghana. While students make bracelets, a climate change video could be playing (See Teacher Notes).

Possible Alternate Subject Integrations:
Social Studies

Teacher Notes

Bracelet Instructions
http://www.youtube.com/watch?v=LgY6Y4D-WFk&feature=relmfu

For students:

Environmental Pollution
http://www.youtube.com/watch?v=8e3fvskBbOA&feature=related

Climate Change
http://www.youtube.com/watch?v=M2Jxs7lR8ZI&list=UUZYTClx2T1of7BRZ86-8fow&index=6&feature=plcp

Enlightenment for instructor:

Climate Change-Voices of Rural Communities in Northern Ghana
http://www.youtube.com/watch?v=kwYwHfTJPX8

Outbound Africa (part one)
http://www.youtube.com/watch?v=zKo49_VsSDo

Outbound Africa (part two)
http://www.youtube.com/watch?v=_2PPfYyzdyw&feature=relmfu