Lesson Title	Climate Patterns
Length of Lesson	One (50 minute) class periods
Created By	Calista Guthrie
Subject	Earth Science
Grade Level	8th grade
State Standards	8th: Inquiry, Earth Science
DOK Level	DOK 2, DOK 3
DOK Application	Categorize, Identify Patterns, Predict, Interpret, Compare, Classify, Graph, Relate, Use context clues, Draw conclusions, Cite Evidence, Develop a logical argument
National Standards	5-8: A (Inquiry); C (Life Sciences), D (Earth Science); E (Science and Technology); G (History and Nature of Science)
Graduate Research Element	Wetlands are characterized based on hydrology, soils, and vegetation all of which are affected by climate.

Student Learning Goal:

MS 8th Grade:

1(b) Destinguish between quantitative and quantitative observations. 1(c) Summarize data. 1(d) Analyze evidence that is used to form explanations and draw conclusions. 4(e) Determination of climatic zones.

National Science Education Standards of Content 5-8:

A: Inquiry: Think critically and logically to make the relationships between evidence and explanations. Use mathematics in all aspects of scientific inquiry. Understandings about scientific inquiry.
C: Life Sciences: Populations and ecosystems.
D: Earth and Space Science: Structure of the Earth System. Earth's History.
E: Science and Technology: Understandings about science and technology.
G: History and Nature of Science: Nature of Science.

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

Graphs for each climate zone (INSPIRE_Guthrie_10.15.12_ClimateData), Climate Table (INSPIRE_Guthrie_10.15.12_ClimateZone), PowerPoint Presentation (INSPIRE_Guthrie_10.15.12_Climate), Example Climate Data (INSPIRE_Guthrie_10.15.12_Example), Reward (fake) Check (INSPIRE_Guthrie_10.15.12_GrantCheck)

Lesson Performance Task/Assessment:

Students will be given a brief overview on the factors that affect climate and of the five major climate zones. This will include precipitation and temperature ranges as well as

seasonal descriptions in each of the five zones. Next students will be separated into groups. Each group represents a team of climate scientists that is studying climate in a region not previously studied. The teams are each given a set of data to analyze (climatographs, annual averages, etc.) and must determine the climate of the region. The students will present their findings to the class.

Lesson Relevance to Performance Task and Students:
Students will learn the characteristics of the different climate zones on Earth. They will then be split into scientific research teams (pairs work best) and each team will be given a climatograph to analyze. The teams will use the data to figure out what climate they are researching. The team will present their findings and conclusions to the class (their scientific audience). Students must convince their audience that they are correct in order to receive funding for additional research. If the instructor desires, they may present some sort of award to the most convincing/professional team.

Anticipatory Set/Capture Interest:
Take AIM at Climate Change will be shown to the class to make them aware of the importance of climate in a fun up beat fashion. Be warned, singing and dancing may break out.

Guided Practice:
Students will be briefed on the major climate zones and then guided through analyzing climatographs in order to analyze their data. As a class, a set of data will be analyzed and climate determined. Next, students will be on their own to analyze a data set.

Check(s) for Understanding:
Throughout the lesson, many questions are asked to allow the students to lead themselves into the learning process. What is convection? How is climate different than weather? When you look at a map what do you notice about the location of deserts? What do you notice about the distribution of climates? Students will be challenged with thinking in terms of large scale climate rather than localized weather. Hadley cells will be discussed mostly to highlight that closer to the equator hot moist air rises making lots of clouds giving us the tropics that have lush vegetation. At the subtropical highs, air is sinking. These high pressure zones where air is sinking correlate with the locations of the world's deserts. Students will observe a map showing that world deserts line up latitudinal as do tropical rainforests. The globe will be presented in a discussion about axial tilt and seasons at which time students will be asked what season it is in various places on the Earth at a certain position in Earth's revolution about the sun. This will be revisited later in the presentation while discussing mid- latitudinal climate zones and the severity of their winters.

Independent Practice:
Students will be split into pairs to analyze climatographs and identify the climate zone the data came from. The key to determining the climate zone is by using the key identifiers column in their climate zones handout. These identifiers are the most important things to consider when determining climate.

Remediation and/or Enrichment:
Remediation – Have students illustrate the key identifiers of each climate zone. If graphing is a challenge, give students a set of numerical data and have them make a graph out of the data for practice in graphing skills.

Enrichment- If desired, have students work in teams of 3 or 4 as climate scientists studying an Earth like planet. Each student on the team should analyze their own set of data and then the team can come together and determine what their planets climate zones. They then could draw it, name it, talk about axial tilt and rotation of the planet, how close it is to the sun etc. They will still present their findings to the classroom of scientists.

Closure:
Each team will present their findings. After each presentation results will be briefly discussed to be sure that the data analysis is valid (this is most important if the group has mis-identified the climate). The class will reward one group with the grant to continue research. A fake check will be presented to the team members.

Possible Alternate Subject Integrations:
Math, Geography

Teacher Notes
Take AIM at climate change
http://passporttoknowledge.com/polar-palooza/whatyoucando/taacc/

For additional climatographs visit
http://www.usclimatedata.com/index.php