Atmospheric Science on the International Space Station

Lesson Title: **Author:** Cassidy (Wilson) Pope
Topic: Climate, Natural Disasters
Targeted Grade Level: 9th, 10th
Time Needed: 5-7 days
Subject Integration: Science, Math, and ELA

Standards:

NGSS

HS-ESS2-4: Energy Variation and Climate Change
Use a model to describe how variations in the flow of energy into and out of earth's systems result in changes in climate. (Cause and Effect)

HS-ESS3-1: Global Impacts on Human Activity
Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (Cause and Effect)

Math/ELA

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)

MP.2 Reason abstractly and quantitatively. (4-ESS1-1),(4-ESS2-1),(4-ESS3-2)

Measurable Student Learning Objectives:

Students will be able to…

- Analyze data from graphs, tables, and images
- Define climate and natural disasters
- Infer how humans are impacted by climate and natural disasters

Lesson Procedure:

5E Model	5E Objectives
Engage *Introduce the lesson with an anchoring phenomenon. Facilitate student questions, discussion, etc. as appropriate. Learn about what students already know and want to know.*	**Procedure:** 1. Using the video about Mt. Saint Helens erupting, have a class discussion on: a. How humans are impacted by natural disasters b. Are there ways to accurately determine when things like this may happen again? **Modifications:** ● Closed Captioning on video ● Increased wait time **Formative/Summative Assessments** ● Door slam ○ Students write 1 big idea they learned or 1 question they have on a sticky note and then "slam" it on the door as they leave class **Resources** ● https://www.youtube.com/watch?v=_4yBPgah52I
Explore *Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.*	**Procedure:** 1. Introduce space "mission": Cloud-Aerosol Transport System (CATS) on the ISS 2. Whole class discussion: a. Based on the video, why do think CATS is an important instrument/tool for us to have? b. What possible ways could this information be useful for humans? 3. Read and answer questions about how CATS tracks atmospheric changes with a case study a. Discuss other ways CATS is used to track atmospheric data **Modifications** ● Closed captioning on video ● Screen reader/text reader on computer **Formative/Summative Assessments** ● Reading questions **Resources** ● https://earthdata.nasa.gov/learn/sensing-our-planet/under-cats-eyes ● https://www.youtube.com/watch?v=1pSDgAbRGVQ&list=PLTXQuaxXBKKwxMhA1Cd9WZvGsT06_j-q_&index=130

Explain *Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new concepts.*	**Procedure:** 1. Notes over natural disasters **Modifications** ● Slides available after class on class site ● Audio recordings of lessons **Formative/Summative Assessments** ● Formative check-ins, ● whiteboarding, ● exit-tickets
Elaborate *Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.*	**Procedure:** ● Explore data representations on the CATS website ○ Make inferences about what the data shown means ○ Make inferences about possibly human impacts that create the data ○ Make inferences about how humans are impacted by non-human created situations that CATS looked at **Formative/Summative Assessments** ● Formative check-ins, ● Whiteboarding, ● exit-tickets **Resources** ● https://cats.gsfc.nasa.gov/iotw/
Evaluate *Assess students knowledge, skills and abilities.*	**Procedure:** 1. Students choose one piece of CATS data to analyze in depth 2. Answer the following based on the data: a. What is the topic of the data? b. What inferences can you make from this data set? c. Why is this data important? d. How could we use this data in the future? **Modifications:** ● Work in small groups ● Extended time **Formative/Summative Assessments Resources** ● Data analyzation project