LP 4 Impact, Adaptation, and Mitigation of Climate Change

# of Days	4		
Prior Knowledge	Depending on students' backgrounds they may or may not be able to identify dependent and independent variables. If students struggle with reading easy graphs, they may need more scaffolding prior to the Stations activity.		
Lesson Objective	Students will analyze the sources for climate data and will analyze this data to identify the impact of climate change on physical and biological systems. Students will identify, compare, and contrast adaptation and mitigation strategies.	Language Goals/Demands	Students will be able to describe the impacts of climate change on the physical system and justify claims with evidence. ELA standards: Reading 2.5; Writing 2.3.b, c; Speaking 1.1, 2.0.b, c
Lesson Assessment	Quiz over using data to make conclusions & mitigation strategies	Changes for Next Time	
(Benchmarks or Standards)			
Materials Needed	Graphs and Questions for each station; Graphs for Causes; Powerpoint slides for Ice Core Explanations, Mitigation Powerpoint	What Worked Well	

Time	Learning Task or Activity	Method & Notes
Day 1		
5 min	BW: Some scientists collect data from tens of thousands of years ago. How do you think scientists can know what happened so far in the past? Discuss your ideas with a partner.	PAIR WORK
20 min	Data Collection Instrumentation - Show students slide #2 pointing out that the data goes back 100,000 years. - Ask for student input about how data is collected especially from periods long ago. (Talk about thermometers, satellites, etc. and introduce ice cores if students don't suggest this) - Pass out Guiding Questions for use.	WHOLE CLASS DISCUSSION/ANALYSIS See Slides 4.1.1 for Ice Core Slides (How do We Know) See 4.1.1 for Ice Core Slides and Notes See 4.1.2 for Ice Core Guiding Questions If you have access to streaming video, you may replace the slide show and data analysis with the KQED video (20 minutes) on ice cores found at: http://www.kqed.org/quest/television/web-extra-at-the-core-of-climate-change
20 min	Assessment on Claims and Evidence - Work on claim #1 as a whole class. - Work claim #2 individually.	WHOLE CLASS/INDIVIDUAL WORK 4.1.3 Assessment on Claims and Evidence
HW	Concept Maps - Add the following terms and relationships to your map: ice core, evidence, claim	

Day 2		
5 mins	BW: Define Anthropogenic. Give 2-3 examples.	INDIVIDUAL WORK/ SHARE OUT WITH WHOLE GROUP
5 mins	Consequences of Climate Change: Sea Level Rise - Ask students to share different consequences for humans or the environment - End by talking about sea level rise as an important consequence for coastal areas like the Bay Area. - Also REMIND students of ALBEDO: different materials/surfaces have different level of reflectivity. Ice reflects more light than other substances. Snow reflects 95% of radiation. The water under the ice can absorb large amounts of heat energy, which could increase temp of water and cause more melting.	LECTURE/DISCUSSION See 4.2.0 Consequences Slides
10 mins	Begin Sea Level Activity - Students will set up Sea Level Activity (in small groups) and record initial observation of water level. - Teachers monitor group progress.	HANDS-ON ACTIVITY See 4.2.1 Sea Level Activity Instructions and Datasheet
15 mins	Quiz over LP 4	INDIVIDUAL SEAT WORK 4.2.2 LP4 Quiz and Key Second observation of ice after quiz.
20 mins	Sea Level Activity Continued - Have students make 2 more observations (at 20 and 30 min) -Teacher lead discussion (based on preliminary observations). What has occurred? What is different? What is the same between the two conditions? What are the scientific principles behind this phenomena? -Students make final observations.	HANDS-ON ACTIVITY CONTINUED See 4.2.1 Ice Activity Instructions and Datasheet.doc Students Check every 10 minutes, recording results on table. Have students work with groups to discuss and answer questions. If there is time, conclude with a whole group discussion.
Day 3		
3 mins	BW: What parts of Earth's systems do you think are changing due to increased greenhouse gases? Think of two or three possibilities.	INDIVIDUAL SEAT WORK

5 mins	Impact of Climate Change on Biological and Physical Systems Stations: - Humans are responsible for significant increased carbon emissions that have an impact on physical and biological systems. Today we are going to look at evidence to make claims about the impact of increased emissions on the physical and biological worlds. You will be divided into groups and rotate through four stations. Each station has the instructions and task cards. You will record your answers on the student handout. - Divide up students into four groups	TEACHER-LED INSTRUCTIONS See 4.3.1 for Group Station Task Cards See 4.3.2 for Student Handout: Impact on Physical Systems See 4.3.3 for Student Handout: Impact on Biological Systems See 4.3.4 for Station Graphs for Physical Systems See 4.3.5 for Station Graphs for Biological Systems
32 mins	Impacts Due to Climate Change - Students will spend approximately 4 minutes at each station and complete task and answer questions with their group members. - **Physical Systems** Stations 1 - 8 align with Graphs 1 - 8. 1-4 are Impacts on Physical System, 5-8 are Impacts on Biological Systems	GROUP WORK See 4.3.1 for Group Station Task Cards See 4.3.2 for Student Handout: Impact on Physical Systems See 4.3.3 for Student Handout: Impact on Biological Systems See 4.3.4 for Station Graphs for Physical Systems See 4.3.5 for Station Graphs for Biological Systems
15 mins	Group Processing/Station De-brief: Group Processing/Station Debrief - What claims can be made about climate change? - What is the evidence that climate is changing? What is the impact on physical systems? - Remind students to support their statements with data from the previous day's stations. - Is this evidence convincing?	TEACHER-LED DISCUSSION Use 4.3.4 and 4.3.5 slides to remind students of the graphs
HW	Respond to the following questions: 1) What do you think will be the easiest consequence to deal with? 2) Based on what we've learned so far, what are some ways that climate change might affect the community where you live?	
Day 4		
5 mins	BW: List one way climate change impacts: a) agriculture b) ecosystems c) weather and d) health	INDIVIDUAL SEAT WORK and SHARE OUT

10 min	Mitigation Review - We have talked about the presence of greenhouse gases and how we detect them, how do you think we can limit them? We will be talking about this at different points over the next few lessons. - Have the chalkboard divided into four parts. Assign student pairs to one sector and have them discuss for four or five minutes how we might be able to decrease or "mitigate" greenhouse emission in these sectors. Have students write ideas on the board under the proper heading - Possible Sectors: Transportation, Heating & Cooling Buildings, Industry emissions, Electricity Use	PAIR WORK Use 4.4.1. Slides to review mitigation OR 4.4.2 Mitigation & Adaptation Slides
10 min	Introduction to idea of Adaptation - Review Mitigation (introduced in earlier lessons). Introduce idea of adaptation. Create a KWL (what we KNOW, what we WANT to know, and what we LEARNED (this column will be filled in later) about adaptation. - We've looked at some of the impacts of climate change, one example is sea level rise. What are some things we can do to prevent more damage from climate change? The changes and adjustments we make are "adaptations". We will be getting more into mitigation with the final lesson (acting regionally or globally).	DISCUSSION *OPTIONAL: Use 4.4.3 Adaptation Resource*
15 mins	The Great Discussion Preparation - Students will work in groups, pulling together the various activities, data, and information they have learned over the course of the Climate Change Unit. Describe how due to resources only ONE area of impact can be addressed. Each student will be assigned one of the four topics from the stations. Why should your topic be the one area addressed? Give examples and evidence to support your position (including feasible and practical mitigations and adaptations).	GROUP WORK The Great Discussion will allow students opportunitythink about acting locally. Teacher will assign each group an area of impact: ecosystem, agriculture, severe weather, or health.
20 mins	The Great Discussion Presentations	STUDENT GROUP PRESENTATION Discussion format: teacher's choice
HW	Write down some things you learned about Climate Change adaptation (KWL CHART).	