Mitigation of Climate Change 2:3

Type of Lesson: Application

Description of lesson: Students will be playing a board game to learn how the city government enacts a plan to adapt to climate change. The point of this lesson is for students to understand that adaptation on a large scale can be difficult and not everyone is alway happy with the result.

Enduring Understandings	**Essential Questions**
Climate is made up of multiple variables, a change in any of those variables can have a major impact on the planet	If predicted future impacts of Climate Change are as bad as the scientific community is predicting, is our home planet doomed or saveable?
Academic Standards: HS-ESS3-1. 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 HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. HS-ENV1-2.* Use a computational representation to illustrate that humans are part of Earth's ecosystems and how human activities can, deliberately or inadvertently, alter ecosystems HS-ENV1-3. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	**Student learning targets:** ● Students will be able to model climate change impacts and mitigation strategies ● Students will be able to analyze different mitigation and adaptation strategies in the rolls of city planners ● Students will be able to map the cause and effect of using mitigation strategies
Assessment task - Causal Loop Diagram on Lesson 3	
Differentiation: This can be differentiated with students based on level of understanding. Some of our classes got a classroom discussion, while the higher level classes completed the worksheet and causal loop diagram on their own. Based on level of student ability that will dictate how involved the teacher will need to be as a facilitator.	**Accommodations:** ● This game can be a bit complicated for lower level students. We play tested this with high school Earth & Space. We found that the best way to not overwhelm them was to give out one instruction at a time. For example, we handed out the role cards, then had students identify important assets. Then we handed out the budget for city planning and talked about that, then we handed out the climate scenarios.
Prior Learning: ● Aspects of Climate	**Prerequisite skills:** ● Following directions for a board game

• Impacts of Climate • Some knowledge of local government and how city planning works	
Materials • Game Board • Role Cards • Climate Scenarios • Budget Cards • Student worksheet • Cost of Adaptation worksheet • Dry erase markers	**Technology:** Printer to print the game and the worksheets
Vocabulary Development: Adaptation vs. Mitigation	

Procedures:
Prior to the start of the game watch this video and talk about the difference between adaptation and mitigation.
https://www.youtube.com/watch?v=2vqPfY7LjP8

This game has been modified from the Marin County Game of Floods and the Delaware Valley Regional Planning Commision Game of Floods. This version of the game has been play tested with Earth & Space Science students at the high school level.

Game Board. The game board is adapted from the Marin Country Game of Floods. It has been adjusted slightly. It will need to be poster printed or printed on separate pages to be taped together. The instructions for this version of the game is dependent on the game board being marked on. Teachers can print several game boards that will be marked on directly or teachers can have game boards laminated and students will mark on them with dry erase markers.
The original game board can be found here:
https://www.marincounty.org/depts/cd/divisions/planning/csmart-sea-level-rise/game-of-floods#:~:text=The%20Game%20of%20Floods%20is,the%20loss%20or%20deterioration%20of

Teacher instructions:

1. Print out the following materials for each group:
    a. Role Card - found in the Game Of Flood PowerPoint
    b. Budgets - found in the Game Of Flood PowerPoint
    c. Climate Scenarios - found in the Game Of Flood PowerPoint
    d. Cost Reference Sheet
    e. Game of Floods Student worksheet (one per student)
2. Split students up into groups of 4. If you have groups that are bigger than 4, consider using more of the City Council Equivalent. For example, split up the people role to represent two different neighborhoods fighting for rights.

Equivalent on a City Council	Game Play Roles
Environmental Management	Environment
City Planning and Sustainability	
Community Representative - HOA President of SeaSpray Estates	People
Community Representative - Advocate for Mudflat Manor	
Wastewater Enterprises General Manager	Infrastructure
Power Plant Enterprise General Manager	
Transportation	
Deputy Mayor	Business
Small Business and Tourist Department	

3. Each team gets a scenario card and a budget card. Teachers can set up play so that everyone gets the same scenario and the same budget. You can give everyone a different scenario and the same budget, or the same scenario and different budget. Find the Scenario and Budget Cards in the PowerPoint Slides
4. Before game play students need to fill out Pg 1 of the student workbook: **Asset Inventory Table**. This page asks students to identify assets that are important to their role.
5. On pg 2 students need to fill in the **Vulnerability Assessment**. This asks students to rank their assets based on how important they are to save. Students will rank on Exposure (which is how likely it will be flooded based on the scenario given) and Importance (How important is this asset to the survival and "function" of the community on the island)
6. Once these pages are filled out the teacher should double check and sign off that students have completed these pages as they see fit to their community role.

Now game play can begin.
Start with the student who is sitting to the Left of the Mayor/Business (the mayor should go last in the round). Have students refer to the Game Play instructions on the side of the game board. They are also in the student workbook and can be posted in the room.

1. Choose an asset to adapt or a general adaptation strategy
    a. Example: We need to move the hospital OR We need to install levees along the beach
2. Propose that asset to the group. The group can argue for or against with their roles, budget and scenario in mind.

3. The person who's turn it is gets the final say on what adaptation to use and what asset to save.
4. Mark on the Map what you have decided to do. Reference the Map Key on the Cost Reference Sheet
5. Add the final decision to the **Adaptation Strategy Record** in the student workbook

Students continue to take turns until the budget is spent or all 20 rounds have been completed.

When students have completed the game - direct them to answer the analysis questions on page 6 of their workbook.

When all groups are complete do a gallery walk so students can see that there is not one right way to do adaptations.

Here are some useful videos to set the tone for the game and to connect Sea Level Rise to Indiana.
https://www.youtube.com/watch?v=j9d6n_uUfFo
https://www.youtube.com/watch?v=aKdU7PxyKkc
https://www.youtube.com/watch?v=nVSvoIQjin4

Attach:
Game of Floods edited Board (PDF)
Role/Budget/Scenario Card (PPT)
Cost Reference Sheet
Student Worksheet