

“Extending the CTE-STEM Pipeline into Middle Schools”

Engineering and Architecture Introduction to Sea Level Rise

Solutionary Phase	Problem Cycle 1
Lesson # and title	Lesson 3: Introduction to Sea Level Rise - Parts, People, Interactions
Duration	45 minutes

Lesson Overview

In this lesson, students are introduced to their first problem cycle. In this 3 lesson sequence, students will dive into sea level rise and start (with teacher scaffolding) the Define step of the Engineering Design Process that was introduced in the fundamentals sequence. They use the Parts, People, Interactions protocol to better understand the effects of sea level rise so that they can come up with problems to solve in the engineering design process.

Learning Objectives

Students will:

- Observe video of Pacifica, Ca cliffs crumbling under houses (from 2016)
 - Extension: [Watch 2021 update](#) to compare
- Analyze video for things that they notice, think, and wonder
- Look at [National Geographic slideshow](#) of other places being impacted by sea level rise (zoom in so only pictures are visible).
- Look for patterns between the video/pictures and make a hypothesis about the cause.
- Read and analyze article on Sea Level Rise, using a “Parts People Interactions” protocol.
 - In the PPI students make inferences and draw connections between various stakeholders mentioned in the article and climate change/sea level rise
- Connect the article to the earlier video/pictures (revise hypothesis if necessary).
- Learn how engineers define problems with a user in mind.
- Identify one of the people from the article to be their “user” in the following lesson.
 - Extension: have students select and research a “user” from another area affected by sea level rise.

Content Standard(s)

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (Grades 6 - 8)
CTE.EA.B.6.1. Understand the steps in the design process.

College and Career Connection(s)

Article linked mentions the following careers:

- Politicians who make policies that can limit greenhouse gas emissions
- Climate researcher and scientist (for Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) program of the Australian government)
- Volunteer youth coordinator (at Kiribati Climate Action Network.)

Equipment, Instructional Resources, and Materials

- Way to project video/slides
- Printouts of article
- Chart paper, Markers, and Post it Notes or Jamboard/Slides

Suggested Student Grouping

- Whole class - Introduction
- Individual - article read through and notes
- PPI Thinking Routine - groups of ~3
- Whole class - share out at the end

Vocabulary

- Parts
- Purposes
- Interactions
- Sea Level Rise
- Users

The Lesson

Preparation

- Print out sea level rise articles for students
Recommend:
NewsELA - Climate change to adversely affect Pacific island nations, by iGeneration Youth [- linked here](#)
Familiarize yourself with names and place names in article before reading out loud
- Parts, Purposes, Interactions instructions
- Chart paper and markers for each group (or Jamboard/Slides)
- Chart paper and markers for teacher to model process of PPI (or Jamboard/Slides)

Lesson Procedure [Lesson Slides Link](#)

Activity/Task	Description	Time (min)
Engage with Sea Level Rise/ Quick review of Engineering Design Process	<ul style="list-style-type: none">• Quickly review Engineering Design Process - focus on Define.<ul style="list-style-type: none">◦ Connect to prior lessons.• Students watch a video of Pacifica Cliffs (2016).• Take notes about what they notice, think, and wonder.<ul style="list-style-type: none">◦ If needed, review the difference between observations and inferences.• Students view Sea Level Rise Will Flood Hundreds of Cities in the Near Future slide deck (zoom in so captions/article are not visible).• Students discuss how images relate to video.• Review Define step and discuss problems they observed.	5 min
Model Parts People Interactions	<ul style="list-style-type: none">• Pulling ideas from students, teacher models how to take the parts, people and interactions identified in reading on to their chart and how to make connections	5 min
Read Article: The Face of Climate Change	<ul style="list-style-type: none">• Students read article on “Climate change to adversely affect Pacific island nations”	15 min
Students do PPI/Discuss findings	<ul style="list-style-type: none">• Students work in groups of 3 to do their own group PPI charts	10 min

	<ul style="list-style-type: none"> Students discuss: <ul style="list-style-type: none"> How does a change in one element of the system affect the various parts and people connected to the system? How do you think the problems in the article connect to the problems you saw earlier in the lesson? Extension: Have students discuss what kind(s) of engineers would be needed to solve the problems they saw in the article. 	
Choose a User	<ul style="list-style-type: none"> Discuss how engineers focus on users to help define problems Groups discuss which user from the article they will focus on 	5 min
Share Out	<ul style="list-style-type: none"> Each Team commits to a person in the article that they want to design/engineer a solution for (and tells why) 	5 min

Assessment

**Collect choices from each team (and pull onto slide for next class) of who they are designing for and why.
This is building up to assessment of this performance expectation:**

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (Grades 6 - 8)

[Sample Book Creator Notebook](#) (optional) Book Creator or Google Slides for daily journal for documentation and reflections. Can be assigned as homework.