



Maryland and Delaware Climate Change Education Assessment and Research (MADE CLEAR)

Climate Change Education in Teacher Education Session 1: Online Sea Level Rise Investigation for Science Methods Interns

Overview

This lesson uses a blended learning approach, engaging teacher interns in science content outside of the classroom and following up with in-class discussion during subsequent lessons. During this online experience, teacher interns will analyze sea level rise data for local coastal communities; investigate the primary causes of sea level rise; and reflect on the utility of technology-based learning about locally-relevant climate change impacts for addressing science curriculum standards, including the Next Generation Science Standards.

Objectives

Teacher interns will:

1. Predict global sea level rise during the 21st century, providing a reasonable rationale for their predictions using sea level rise projection data.
2. Describe potential impacts of sea level rise on human safety, economic activity and tourism, and ecosystems in the Mid-Atlantic.
3. Explain two major factors contributing to sea level rise (thermal expansion and land-based ice melt), and list at least one other contributing factor (land subsidence, ocean currents, gravitational pull).
4. Reflect on the pedagogical utility of the online sea level rise investigation, particularly the opportunities it affords for technology integration and investigation of locally relevant climate change impacts, for addressing science curriculum standards.

Materials

- Student access to individual computers with Internet
- [Investigation instructions \[linked\]](#)
- [Investigation guide](#)
- [Climate Profile Survey instructions \[linked\]](#) (optional)

Getting started

During the class session prior to the online sea level rise investigation, explain to teacher interns that they will be beginning a three-session series focused on the topic of climate change* education. The series will model a blended learning approach beginning with an online class session. Interns may complete an online investigation during the week the course would regularly meet, or complete it as a homework assignment. In the two subsequent sessions, interns will discuss and expand upon the online investigation experience. [Investigation instructions](#) should be emailed to interns or posted on your course website. Specify to teacher interns how they will turn in their completed [investigation guides](#) (via email, course website, or hard copy).

**Instructors interested in having interns reflect on their own views of climate change may choose to assign the online [Climate Profile Survey](#) prior to engagement in the sessions.*



Sessions were designed by the MADE CLEAR Learning Sciences Research Team (www.ClimateEdResearch.org) at the University of Maryland and implemented in courses taught by J. Randy McGinnis (jmcginni@umd.edu) and Emily Hestness (hestness@umd.edu). Please contact the instructors with any questions or comments.



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Procedure

Note: The steps below describe the online investigation experience that teacher interns will complete, as guided by the 5 E lesson plan framework. These steps will be self-explanatory to interns as they engage in the online investigation; the course instructor simply provides the [investigation instructions](#).

Engage

Teacher interns go to the online investigation website at <http://www.climateedresearch.org/science-methods/sea-level-rise> to begin. Here, they are reminded of their roles as learners (investigating sea level rise in the Mid-Atlantic) as well as future teachers (reflecting on the utility of online tools, such as this investigation, for teaching science content). Teacher interns select a geographic area to investigate: Assateague, MD or Rehoboth Beach, DE. They are then prompted to respond to the following question in their investigation guide:

- *Write down three things (or more) you already know about sea level rise (e.g., why it's happening, factors causing it, impacts on communities and ecosystems).*

Responses to this question can help course instructors gain insight into teacher interns' prior knowledge of sea level rise.

Teacher interns are presented with some general information about the geography of their selected Mid-Atlantic location (Assateague, MD or Rehoboth Beach, DE).

Explore

Teacher interns examine a graph from the National Climate Assessment that depicts various global sea level rise projection scenarios for the 21st century. They are asked to consider which projections are likely the most relevant, noting that some do not take ice melt (a major contributor to sea level rise) into account.

On their investigation guide, teacher interns respond to the questions:

- *How much will global sea levels rise by 2100? Use the graph with sea level rise scenarios to inform your response.*
- *What was your reasoning for choosing this amount you listed above? Was there anything that made it difficult to predict sea level rise for 2100?*

Having explored global sea level rise projection scenarios, teacher interns then examine sea level rise projections for their selected Mid-Atlantic location. They look at a map that provides satellite imagery of the features of their coastal location, as well as an interactive map depicting the extent of sea level rise for different projections at this geographic location.

In their investigation guides, teacher interns make observations about potential local impacts of sea level rise on:

- *Human safety*
- *Economic activity and tourism*
- *Ecosystems*

Explain

Next, teacher interns are introduced to the science behind sea level rise. Two primary reasons for sea level rise are presented:

- 1) Ice is melting and flowing into the world's oceans.
- 2) Water in oceans is expanding (thermal expansion).

Teacher interns read descriptions of these phenomena and view a short video animation demonstrating thermal expansion at the molecular level.

Other factors contributing to sea level rise are briefly introduced, including land subsidence (a factor of particular importance in the Mid-Atlantic), ocean currents, and the gravitational pull of large ice sheets.

Elaborate

Having been introduced to the science content related to sea level rise, teacher interns are prompted to consider strategies for teaching the topic. In their investigation guides, teacher interns respond to the questions:

- *Now that you have experienced an example of an online science learning experience, what ideas do you have about using technology to support your students' science learning?*
- *How might you teach your students about locally relevant issues related to environmental sustainability (e.g., climate change and its local impacts)?*
- *Throughout this module the NGSS Connection box on the left of your screen provided climate change related standards. How would you foresee using these climate change related standards in your own teaching?*

Evaluate

Provide teacher interns with instructions for turning in their completed investigation guides. The responses provided in the investigation guides can be used to assess teacher interns' progress toward learning objectives 1, 2, and 4 listed above. Their understanding of the primary causes of sea level rise can be assessed during subsequent in-class discussions

Investigation Instructions for Teacher Interns

Visit the website at <http://www.climateedresearch.org/sea-level-rise/science-methods> to complete the online investigation.

As you move through the online investigation, complete the accompanying [investigation guide](#), providing thorough responses to each question. **You will need to save your completed PDF investigation guide document to your computer or flash drive** in order to turn it in.

Note: You will also see questions related to technology-based education pedagogy (next to the bolded text that says **Teacher Perspective**). These questions are for your own reflection, but you do not need to write down responses.

We will debrief at our next in-class meeting. If you have any questions, please do not hesitate to email me.

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Climate Profile Survey Instructions

Through this activity, you will reflect upon your beliefs and opinions about the issue of climate change. This activity models one way to gain insight into learners' beliefs about science topics. Gaining insight into students' beliefs before teaching a potentially sensitive science topic especially can help teachers prepare to address the topic in the classroom.

1. Visit the website below and complete the survey *What's Your Climate Profile?*
<http://uw.kqed.org/climatesurvey/index-kqed.php>
2. Take a screenshot of your result, and save it to your computer. For help, see:
<http://www.take-a-screenshot.org>
3. Read the description of your Climate Profile group.
4. Email me your results.
 - In the **subject line** of your email, write Climate Profile Survey.
 - In the **text** of your email, write 2-3 sentences in response to the question: Does the Climate Profile quiz result accurately describe your beliefs? Why or why not?
 - **Attach or embed** your quiz result screenshot in your email.

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