

# The Science Behind the Stories: A Research-Based Transdisciplinary Approach to Climate Literacy

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## Abstract

In this article, we first outline an inquiry-based pedagogical model for studying scientific phenomena through the lens of a story. Then, we offer a middle school example that educators can pilot in their classrooms or use as a guide for constructing their own. The middle school pilot opportunity explores the science behind coastal erosion and the impacts of sea level rise in Julie Bertagna's [Exodus](#).

## Keywords

[climate change](#), [sea level rise](#), [climate science](#), [pedagogical models](#), [science fiction](#), [fantasy](#), [Exodus](#)













## A Pedagogical Model for Exploring the Science Behind the Stories

Storytelling is a practice that has a long history in helping humanity make sense of the world. Stories are powerful because they help bring data to life, allowing learners to connect meaningfully with information that may otherwise feel abstract. Stories, therefore, can be valuable [teaching tools](#) for promoting deeper learning of complex phenomena such as climate change and its impacts, direct and indirect, on each learner.

As a universal lens, narratives about the environment can facilitate conversations about the impacts of climate change by encouraging exploration into the patterns of human behavior that

contribute to them. Leveraging cognitive research on mirror neurons, narrative empathy, and theory of mind, a transdisciplinary approach to climate literacy positions storytelling as a framing lens for critical topics that engage K-12 students in climate literacy education.

Investigating the science behind stories that address the impacts of climate change can help teachers guide collaborative problem-solving, critical thinking, and communication. We offer here a visual (see Figures 1 and 2) and written outline of a 9-step inquiry-based pedagogical model designed to foster students' climate literacy, empathy, and collective agency. If you are a teacher interested in piloting this model to help your students examine [coastal erosion](#) and [sea level rise](#) through the lens of Julie Bertagna's young adult novel [Exodus](#), please contact Mary-Alice Corliss and Rebecca Young ([maryalice.corliss@cognia.org](mailto:maryalice.corliss@cognia.org); [rebecca.young@cognia.org](mailto:rebecca.young@cognia.org)). We are seeking educator and student feedback as we continue to develop this model and to build task designs merging stories and scientific phenomena across grade levels.

Real-World Performance Task Design		
<b>Read the Narrative</b>		 Story as Lens
<b>Explore the Science</b>		NGSS Connections
<b>Reflect on Perspectives</b>		The Empathy Continuum & SEL 
<b>Analyze Contexts</b>		Characters, Conflicts, Settings
<b>Examine Data</b>		Science Stimuli
<b>Evaluate Solutions</b>		Mitigation/Adaptation
<b>Collaborate to Problem-Solve</b>		Synthesize & Share Information
<b>Create &amp; Communicate</b>		What can we do with what we know?
<b>Demonstrate Learning</b>		Assess Skills & Understanding 

## Real-World Performance Task Design

### Read the Narrative

Read a story or narrative excerpt that addresses an aspect of climate change. This story (fiction or nonfiction) frames the instruction and must feel relevant to students because of its setting, conflict or characters. Choosing an emotionally engaging story or episode cannot be emphasized enough—

this investment is critical for learning, not only helping learners better retain new information but allowing them to process information empathetically to promote prosocial action.

### **Explore the Science**

*Explore* the science behind the phenomenon that drives the conflict of the story (e.g., [sea level rise](#), [coastal erosion](#), [species extinction](#), [pollution](#), [weather](#)). A phenomenon is more than simply a topic related to climate change: it is an observation that requires explanation of a problem that requires a solution. When framed in a storyline, students can use that context to develop a deeper understanding of the phenomenon.

### **Reflect on Perspectives**

*Reflect* on the phenomenon as it relates to the broader context of climate change, including, as appropriate, its local and global impacts. Reflections should take place before, during, and after studying the narrative and should address both understanding and perception of the phenomenon (scientific, social, and others). [The Empathy Continuum](#) supports discussions related to the perspectives of characters and readers with the goal of engaging differing points of view and experiences.

### **Analyze Contexts**

*Analyze* climate-related contexts illuminated by the narrative: from setting descriptions that illustrate environmental impacts, through historical, social, or political backdrops that inform the story's central conflict, and on to the personal motivations that drive character actions and dialogue related to it. Targeted standards-based questions scaffold toward a culminating transdisciplinary performance task.

### **Examine Data**

*Examine* the phenomenon as it is presented in the story and consider the science behind claims, challenges, and potential solutions the author or narrator is exploring. Real-world data stimuli are invaluable to support students' understanding of the problem's complexity, pervasiveness, and long-term impacts.

### **Evaluate Solutions**

*Evaluate* existing and potential solutions based on real-world contexts related to the phenomenon, gathering information from a variety of sources that helps extend appreciation both for what is happening in the narrative and in reality (present and future). Investigate the effectiveness of solutions and make data-based predictions related to the story and any real-world parallels.

### **Collaborate to Problem-Solve**

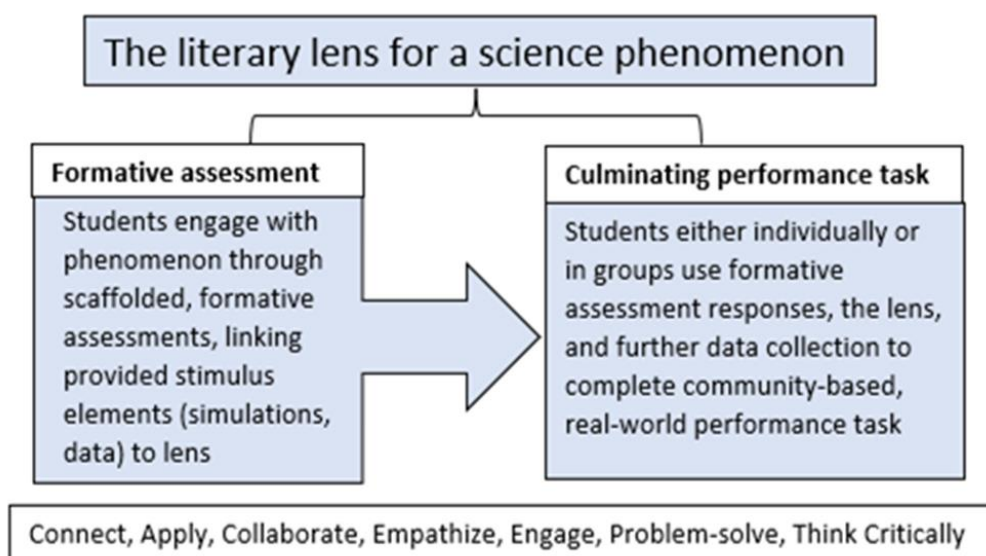
*Collaborate* to collect information and engage in problem-solving. Compare narrative-based and real-world evidence to focus decisions, seek additional information, and develop solutions. Synthesize findings across content areas and prepare recommendations for narrative-based and/or real-world audiences.

### Create and Communicate

Create a product or presentation designed to *communicate* your findings with others (connected to the storyline and/or the school community). Final products and presentations incorporate a transdisciplinary approach to learning, pulling from multiple subject and skill areas to respond to a real-world problem. *Share* learning experience using final products and/or presentations with peers, school leaders, or community panels. Sharing is designed to promote awareness and inspire action.

### Demonstrate Learning

This task can be adapted for use as an instructional plan, as a formative or summative assessment based on scaffolded instruction, or as a performance-based project. Assessments of learning can include self-reflection, peer reviews, and rubrics.



### Interested in Piloting a Climate Literacy Task?

In this last section we share an example of an opening task for the 9-step model of teaching climate literacy we introduced above. In this task, students are asked to analyze the science underlying the main conflict in the opening of [Exodus](#) by Julie Bertagna.

Set in a dystopian future of 2099, the story opens on Wing, an island where the protagonist Mara lives with her family. The island is about to experience the same fate as most other land masses in the story’s world as global sea-level rise threatens to completely submerge it. The 6-page [“The Swallowing Sea”](#) chapter sets the conflict in motion as Mara tries to persuade her family and other residents that they must leave their home in search of higher ground, if any still exists.

“The Swallowing Sea” establishes the conflict between Mara’s expectations to continue to live on the island of Wing and the reality of global sea level rise, due to climate change, that will

soon swallow the island. The chapter also comments on the patterns of human behavior that contribute to inaction. As the book unfolds, denial, fear, and misunderstanding are represented in the opposition Mara faces, making it an effective lens through which to explore the complex contexts fueling today's real-world conflicts in attitudes about climate change.

The chapter, as an excerpt, could serve as an introduction to the science of [coastal erosion](#) or [sea level rise](#) or as part of a broader study on the impacts of a warming planet, specifically [climate-related migration](#) and the limitations of natural resources. The novel itself could be studied in full as part of a climate-focused literature unit too. It is highly engaging for the age group and offers rich opportunities for analyzing human behavior in response to climate change challenges.