Water is Life: The Earth's Hydrosphere and Its Impact on Living Systems Grades 6-8 Earth Science Module

A CCSS-Aligned Curricular Module for Middle School Science Teachers
Developed by Expeditionary Learning in Collaboration with Student Achievement Partners

Overview This module was developed by Expeditionary Learning (EL) as an exemplar of Common Core aligned instruction. The module was produced to address key questions related to powerful implementation of the Common Core State Standards (CCSS):

- What could it look like to implement the CCSS in a science classroom?
- How do we build the disciplinary literacy skills students need in order to read, write, and think like scientists?
- How do we engage and support *all* learners in meeting the CCSS through careful practice and supportive materials?

We honor teachers as professionals, and expect teachers would modify and refine the lessons to meet the needs of their students and context. This is offered as one concrete example, an invitation, and an inspiration to others to extend this and to do their own work.

As a professional development resource: The module serves as a model for teachers, to breathe life into the CCSS so teachers have a clear vision of what this type of instruction can look like, and better understand the powerful role the CCSS can play in building students' content knowledge.

Teaching notes signal the kind of planning and thinking such instruction requires. Key teaching moves, in particular close reading with complex text, are described in enough detail to make it very clear what is required of students, and how to support students in doing this rigorous work. Specific instructional strategies or protocols are described that support students' reading and writing with evidence. There is a major effort made to demonstrate ways to select and work with academic language (vocabulary and syntax) in order to make complex text and its wealth of ideas and knowledge accessible to all students.

As curriculum to use, adapt, or build from as you see fit: The module will help teachers achieve two goals: build students' content understanding (of the module topic) and help student develop the content literacy skills needed for College and Career Readiness.

Materials include summative assessments, central texts, and key resources. The modules also include lesson level agendas with: suggestions of activities, text-dependent questions, and daily assessment to give teachers clear guidance on the particulars, while still leaving room for teachers to adapt lessons. The modules could also be adapted for other grade levels, if the rigor of the text-dependent questions were ratcheted either up or down or alternate materials of greater or lesser complexity were folded in with new questions and tasks developed.

A Note on Structure:
The lessons are designed for a 90-minute block periods, but can be easily divided into 45-minute periods or modified further to fit any school schedule.

Unit 1: Water is Life: The Heart and Science Behind this Phrase

Module Overview: In Unit 1, students build background knowledge about the central role that water plays in all life. This unit includes a close read of Barbara Kingsolver's text "Water is Life." In Unit 2 (Global to Local: My Watershed in the Hydrosphere), students use the US Environmental Protection Agency My WATERS Mapper to explore the specific rivers and streams and watershed boundaries for the major US watersheds and the USGS National Water Information System to examine surface water flow, underground water levels, and water quality parameters for student's local watershed. Unit 3 (Scientific Writing: Using Evidence to Explain the Need to Protect "The Water Commons") provides scaffolding toward students' summative writing assessment (see below).

Module Big Ideas

- A small portion of the water in the Earth's hydrosphere is accessible for human consumption. The amount of fresh water that exists and where it is stored affects us all. These fresh water resources are distributed unevenly around the planet as a result of past geologic processes and more recent human actions.
- Scientists and engineers read and review multiple sources of scientific and technical text to evaluate the merit and validity of a claim.
- Scientists communicate information, evidence, and ideas using tables, diagrams, graphs, models, interactive displays, and equations.
- Scientists use models to make and test predictions in order to make sense of the world.

Module Guiding Questions:

- How can the properties and movements of water (around the Earth) help us explain the phrase "water is life"? (Units 1, 2, and 3)
- How can we use the water cycle to understand the phrase "water is life?" (Unit 1)
- How and why can water quality issues in one watershed affect the quality of water in other watersheds? (Unit 2)
- How do our increased understanding of the hydrosphere, watersheds, and human uses of water impact our fresh water resources? (Unit 3)

Unit 1 –Eight 90 minute Lessons Overview: When we think about the water cycle, most of us think of a diagram with arrows that represent water flowing from mountaintops though rivers and streams into the big, blue ocean. This idealized diagram does not teach us the importance of water in sustaining life on Earth or what life might be like if this pattern were disrupted. In the first unit of this Earth Science module, students will use close analytical reading strategies to explore these ideas and others as presented in the article "Water is Life" by Barbara Kingsolver. Throughout the unit, student will grapple with the thesis of the article and identify the evidence that Kingsolver uses to support her thesis. To understand the hydrosphere and hydrological cycle, students will study different models scientists use to understand and communicate about these dynamic processes.

Students will discuss how scientists use models and how models can change to reflect system dynamics, deeper understanding, and the needs of the audience. The summative assessment for

Summative Assessment Unit 1 Writing Prompt (based on Literacy Design Collaborative Task 11): After reading "Water is Life", studying the NASA video on the Earth's Water Cycle, and studying various texts from the *USGA Water Basics* website, students create a conceptual model of the hydrosphere and write an explanation to go along with their model about why only a small portion of Earth's water is accessible for human consumption.

Unit 1 Lessons

This unit is comprised of eight lessons designed to build scientific knowledge and vocabulary about the relationship between the hydrosphere, hydrologic cycle, and the Earth's living systems. Student will make sense of the article; *Water is Life*, by Barbara Kingsolver, through a sequence of lessons that include close reading, vocabulary support, and text dependent questions. The unit includes a higher level of "scripting" for the initial close reading Lessons 1 through 4, to provide support and guidance for teachers about how to implement these types of reading lessons; teachers can draw on the practices modeled in these early lessons as the student's continue read this very complex text. The unit also includes earth science instruction to help student understand the complex science concepts addressed in Kingsolver's article. Throughout the lessons, student will be developing the knowledge, skills, and vocabulary to create conceptual models and explanations of the phenomena being studied. After Lesson 2, the students will create a conceptual model and explanation of the hydrological cycle; after Lesson 4 the students will create a conceptual model and explanation of the relationships among the hydrosphere, atmosphere, lithosphere and the biosphere; and after Lesson 8, the students will create a conceptual model of the hydrosphere with an explanation of the limits of fresh water resources on Earth.

Understanding the Hydrologic Cycle

- Lesson 1: Introducing the Big Idea "Water is Life"
- Lesson 2: The Water Cycle

The Relationship between the Hydrosphere, Atmosphere, Lithosphere and the Biosphere

- Lesson 3: Distribution of Fresh Water Resources
- Lesson 4: The Impact of Water Scarcity on Living Systems

Using Models to Understand this Watery Planet

- Lesson 5: How Scientists Use Models to Make Sense of the World
- Lesson 6: Using Models to Make Sense of the Hydrosphere

Creating Models to Explain the Limits of Fresh Water Resources in the Hydrosphere

- Lesson 7: The Water Commons
- Lesson 8: Synthesis, Conceptual Model, and Assessment

This module addresses the following grades 6-8 Common Core English Language Arts and Literacy standards in Sciences and Technical Subjects and specific content standards drawn from the Next Generation Science Standards (NGSS).

Common Core State Standards	*Scientific Thinking and Literacy Skills:*	*Disciplinary Core Ideas and Standards*
Cite specific textual evidence to support analysis of science and technical texts. (RST.6-8.1) Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (RST.6-8.2) Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (RST.6-8.4) Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. (RST.6-8.5) Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. (RST.6-8.6) • Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (RST.6-8.7) Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (RST.6-8.9) Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	*Literacy* The student will: • use close reading strategies to make sense of complex text. • analyze the structure of a complex text to determine how the author uses science, observational evidence, and personal connections to support his/her claim. • write a supporting explanation for a conceptual model using scientific vocabulary. *Earth Science* • hydrosphere and the hydrologic cycle. • describe and diagram the relationship between the hydrosphere, atmosphere, lithosphere, and biosphere. • explain how an increase in fresh water consumptions has resulted in desertification in some parts of the world. • create a conceptual model of the hydrosphere.	MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2) • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2) MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. • Develop a model to describe unobservable mechanisms. (MS-ESS2-4) • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. • Develop and use a model to describe phenomena. (MS-ESS2-1),(MS-ESS2-6) • The ocean exerts a major influence

(WST.6-8.2) Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 6 topics, texts, and issues,* building on others' ideas and expressing their own clearly. (SL.6-8.1)		on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6) • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) • Weather and climate are influenced by interactions. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)

Unit 1 Central Texts

- "Water is Life" by Barbara Kingsolver http://ngm.nationalgeographic.com/2010/04/water-is-life/kingsolver-text
- Earth's Water Cycle NASA Video http://svs.gsfc.nasa.gov/vis/a010000/a011000/a011054/index.html (video and transcript)
- *The Earth as a System: Earth's Spheres, Gallaudet University,* (Slides 3-7): sci.gallaudet.edu/MSSDScience/ESSSpheres.ppt
- *Relationship between the atmosphere, hydrosphere, lithosphere, and biosphere diagram:* http://www.britannica.com/EBchecked/media/112176
- How Water Availability may change, as temperatures, population, and industrialization increase, 1961 – 1990. BBC News, December 2009: http://news.bbc.co.uk/2/hi/science/nature/7821082.stm
- Desertification Curriculum from United Nations Education, Scientific, and Cultural Organization: http://www.unesco.org/mab/doc/ekocd/index_case.html
- Climate and Water: In the Air and on Land, National Center for Atmospheric Research: https://spark.ucar.edu/longcontent/climate-and-water-air-and-land
- Blue Marble Globe Images and Animation Files, NASA: http://visibleearth.nasa.gov/view.php?id=57723
- Tropical Rainfall Measuring Mission – Middle School Overview. NASA: http://trmm.gsfc.nasa.gov/overview_dir/why-ms.html
- Water Cycle Model. United States Geologic Survey (USGS). http://ga.water.usgs.gov/edu/watercycle.html
- Water Cycle Model. Center for Atmospheric Research. https://www2.ucar.edu/atmosnews/people/aiguo-dai
- Water Cycle Model. Encyclopedia Britannica. http://www.britannica.com/EBchecked/topic/278858/hydrologic-cycle
- Water Cycle Model. U.S. Environmental Protection Agency.

http://www.epa.gov/climatechange/images/impacts-adaptation/WaterCycleChanges.jpg

- Water Cycle Model. BBC Education Scotland. http://www.bbc.co.uk/scotland/education/int/geog/rivers/hydrological.shtml
- Why Care About Water. National Geographic: http://video.nationalgeographic.com/video/environment/freshwater/env-freshwater-whycare/

Unit 1 Teaching Notes

- This unit has students consistently doing the work of scientists: closely reading and evaluating texts, comparing the information gained from text with information gained from videos and using models to understand how the world works. Initially, students do this with a lot of teacher guidance; as the module continues, they do so with greater independence. Students read closely a seminal text, "Water is Life," throughout Unit 1. Certain close reading practices are also applied as students analyze other types of scientific texts, including informational text, data tables, maps, and media.
- There are several resources and routines to support implementing close reading of scientific text.
    - The appendix contains a model for how to analyze a text prior to using it with students. This is for teacher reference only and highlights note that determine where and when science concepts are referred to. These are spots where students will need more support and direct instruction. This document also reflects the vocabulary words which students will most likely need additional support when encountering.
    - In Unit 1, the agendas provide quite a bit of detail regarding the close reading of a complex text and multiple types of scientific models. All lessons that involve a close reading will utilize two documents: "Water is Life" Student Text with Glossary and a "Water is Life" Text Dependent Question Recording Form (see appendix) specific to that lesson.
    - Lessons 1 through 4 are more detailed than Lessons 5 through 8. When necessary, refer to the suggestions in the detailed agendas about vocabulary and text dependent questions, and use the Helping Students Read Closely to plan a close reading lesson that will meet your students' needs.
- **This module represents a shift in how vocabulary instruction** has typically proceeded in content area classes. A handful of content specific words that are central to the module (e.g., hydrological cycle, hydrosphere, atmosphere, lithosphere, biosphere) are taught directly, practiced frequently, and assessed. To address the premise of literacy instruction in the Common Core, students will acquire rich vocabularies by frequently thinking about the meanings of the words they encounter while reading complex texts. The lessons also provide opportunities for students to sharpen their capacity to use context clues to determine the meaning of words. In addition, time is included for frequent conversations with students about the words they encounter while reading. The three specific vocabulary strategies used in this module include:

- **Pre-teaching vocabulary:** Teacher provide definitions for a handful of words central to the science concepts being taught and for general academic vocabulary that are central to the text and whose meanings cannot be determined from context.
- **Instruction and support in using context clues**: Teachers provide opportunities for students to discuss the meaning of many more words that they encounter while reading, and the teacher supports them in using word parts and context clues to determine what they mean and gives them the chance to check their hypotheses.
- **Interactive Word Wall** (see appendix): Conceptual understanding in science is built on understanding of and accurate use of scientific vocabulary. In this Unit, students and teachers will document specific science vocabulary and definitions on vocabulary cards that will be used regularly to create conceptual models that reflect the relationships and dynamics of various parts of the Earth's systems.

- These intentional instructional practices expose students to a large number of new words and build the skill that will ultimately increase vocabulary – the ability to learn new words through wide reading. **Students use science notebooks throughout this module. Remind students that their notebooks are intended for formative assessment (assessment for learning) purposes only.** They use their notebooks to record their thinking and learning. The notebooks are not graded. The teacher should review entries in the science notebooks regularly and offer feedback for students in preparation for future summative assessments. Recording forms can be glued into the science notebook.
- Students need support to increase the quality of their class discussions, whether partnered, in small groups or in whole groups, such as the Science Talk (see appendix). The Talk Science Primer developed by TERC provides rationale and tips that help teachers to structure in-class discussions. The National Academies Press book *Ready, Set, Science* by Michaels, Shouse, and Schweingruber, includes a vignette on "Establishing Norms for Discussion".

Module Routines

- Reading: Multiple and close reading of complex text
- Reading: Teacher reads aloud short excerpts of complex text to promote fluency. This read aloud should be "pure": simply read slowly, fluently, without interruption. Students follow along. After the read alouds, students get to reread, think, and talk about the text, in order to figure out what they can on their own.
- Writing: Use of detail and scientific language to explain conceptual model using Graphic Organizer for Explanatory Text
- Writing: Written response to Literacy Design Collaborative (LDC) tasks (summative assessments)
- Speaking and Listening: Small group synthesis tasks promote ongoing small group discussions
- Language: Interactive World Wall (see appendix). Interactive word walls provide students the opportunity to manipulate concepts and processes to synthesize meaning. Students can physically rearrange vocabulary terms to show possible relationships. Time for this is explicitly built into several lessons and this is an excellent strategy to use any time to check understanding.

- Language: Science vocabulary cards. Each student will create and keep a collection of his/her own scientific vocabulary cards. These will be used to create conceptual models and to explore the relationship among concepts throughout the unit.

General Lesson Sequence

Lessons 1-2: Understanding the Importance of Fresh Water (two 90-minute lessons)
Rationale: These early lessons build a compelling case for considering fresh water as a fundamental ingredient for life on Earth while building students' academic and content-specific vocabulary. Students read closely paragraphs 1 through 3 of the text, "Water is Life". Students and teachers develop clear routines using four different vocabulary strategies during the close reading process, respond to text-dependent questions, and use the Interactive Word Wall to develop their first conceptual model of the hydrologic cycle.

These lessons address the following skills and activities to develop facility with the targeted standards:

- Using close reading strategies to make sense of complex text.
  - Define and use the content-specific terms below:
    - Atmosphere, Aqueous, aquifer, climate, condensation, cycle, distribution, drought, erosion, evaporation, flood, fresh water, glacier, ground water, hurricane, hydrology, hydrologic, hydrosphere irrigate, lithosphere melt water, nutrient rich, precipitation, physics, saline, water vapor, water table, weather,
- Analyzing the structure of a complex text to determine how the author uses science, observational evidence, and personal connections to support his/her claim.
  - Discuss why Kingsolver uses her experiences with her daughter in her introduction to the article, "Water is Life"..
  - Identify how Kingsolver used scientific theory to support her thesis.
- Explaining the hydrosphere and the hydrologic cycle.
  - Create a conceptual model of the hydrologic cycle.
  - Use scientific language to describe the hydrologic cycle.

Informal Assessment Options *Student work or evidence of learning that teachers may use to informally gauge class progress.*	**Individual Student Assessment Options** *Students' more formal, individual written assessment that teachers may collect to more formally assess based on mastery of learning objectives above*
Entry Task - Science Notebooks "Water is Life" Text Dependent Question Recording Form Interactive Word Wall exercises related to Hydrologic Cycle Exit Tickets - Science Notebooks	Hydrologic Cycle Flow chart with brief explanation (Lesson 2)

Lesson 1 - Introducing the Big Idea "Water is Life"
Teaching Notes

- Barbara Kingsolver's article "Water is Life" is a very difficult text for middle school readers. Read the

article in advance to identify academic and scientific vocabulary and grapple with the structures used by the author to support her thesis. You will find an analysis of the text in the appendix (Water is Life Text Analysis), done by Expeditionary Learning in order to plan these lessons. This analysis serves two purposes: first, to heighten teachers' awareness to the complexity of this particular text; second, to model the type of analysis that science teachers can do with any complex text to determine what concepts, vocabulary, or aspects of text structure are most important or will prove most challenging to students.

- In Lesson 1 and 2, students explore the phrase "Water is Life" through the practice of close analytical reading of paragraphs 1 -5. These lessons provide the first opportunity for students to read and re-read passages from "Water is Life" with attention to vocabulary and central ideas. As they unpack the rich metaphors and images created by Kingsolver, they will explore what she means when she says, "Water is Life." Note that throughout Unit 1, students will read and re-read sections of the article: they first hear it read aloud, then reread for main ideas, and then respond to text dependent questions. Establishing strong analytical reading practices in these first few lessons will allow lessons to flow smoothly as the unit progresses.
- Because of the complexity of the language used in this article, specific routines related to vocabulary are introduced. Some vocabulary terms are pre-taught. These words were very strategically chosen because they are crucial for understanding and cannot be determined easily from context. Similarly, provide general academic vocabulary that the students will need to understand the complex metaphors and references used by the author After the first reading, student will identify additional unfamiliar science and academic vocabulary and use context clues to figure out the definition of those terms. This focus on vocabulary, with a particular emphasis on using context clues, is important for student to develop their analytical reading skills and deepen comprehension of complex texts.
- The "close read" of the article "Water is Life" is provided in some detail. This routine – having students grapple with the text on their own, then prompting them to reread to figure out new vocabulary and answer text-dependent questions and then debriefing their work – will be repeated throughout the unit, but is described in less detail in later lessons.
- In Lessons 1-2, establish a strong routine for using an Interactive Word Wall (see appendix). You will need a supply of large blank index cards and a supply of Interactive Word Wall Arrow Cards for the conceptual modeling process. Students will need their own supply of small index cards, arrows, a plastic bag, and rubber bands to manage and store their cards. Each time you add a new science word to the Interactive Word Wall, model writing the word on one side of the card and the definition on the back. Students will create their own vocabulary card, also with the word on one side of the card and the definition on the back. During sections of the lesson when you are sorting, creating flow charts, or creating conceptual models, students should use their own cards at their desks or table. As the lessons progress, have students work with their own cards; then use their work to create a class model.
- If you do not use science notebooks, consider how your student will manage the multiple texts, graphic organizers, and recording forms that you will use during this module. In many cases, you will have a choice of either photocopying a worksheet for students or projecting a set of directions and/or questions and having them do work in their notebooks.
- In general, these lessons suggest questions for entry tasks and exit tickets, but do not provide worksheets or

handouts for them. We recommend that students complete these tasks in their science notebooks; however you may also create handouts. You should always write the entry task or exit ticker question on the board so students have something to refer to, whether they are doing entry tasks, responding to a reading, or having a discussion.

Lesson 1 Materials

- Science Notebooks, internet
- "Water is Life" by Barbara Kingsolver http://ngm.nationalgeographic.com/2010/04/water-is-life/kingsolver-text
- Earth's Water Cycle NASA Video http://svs.gsfc.nasa.gov/vis/a010000/a011000/a011054/index.html (video and transcript)
- "Water is Life" Student Text
- "Water is Life" Text Dependent Question Recording Form
- NASA Earth's Water Cycle Video Text – vocabulary analysis (To be used as needed for ELL or other students with auditory processing difficulties)
- Lingering Questions anchor chart
- Ideas and Vocabulary for Paragraphs 1-3 anchor chart

Lesson 1 Agenda

1. Entry Task (5 min)

A. Explain Entry Task Routine (2 min)
- Identify where students will find the entry task each day
- Expectation that the written response is done individually and is usually brief. Students should write responses in Science Notebooks

B. Complete Entry Task: "The amount of moisture on Earth has not changed. The water the dinosaurs drank millions of years ago is the same water that falls as rain today. But will there be enough for a more crowded world?" (3 min)

2. Opening (10 min)

A. Introduce Think/Write-Pair-Share protocol (see Questioning Strategies Protocol in appendix) and text (2 min)
- List parts of the protocol; briefly explain purpose of each. You might say something like, "I am looking forward to hearing your thinking about this quote and about other documents we will study. Having time to think alone and time to work with a partner often helps students do their best thinking. We will often use a protocol called Think/Pair/Share where first you think, and often write, by yourself; then you and your seat partner talk about your ideas; and finally, we talk as a whole class. Let's try it with the quote from our Entry Task."
- Ask the students to re-read the quote silently and then read what they had written in their notebooks during the entry task.

B. Think/Write-Pair-Share (5 min)

- Have the students discuss what they wrote in their notebooks about the picture of the Earth that is projected on the screen.
- Cold call on students to share out.
- Teacher notices and names ways in which students are collaborating effectively during partner talk and share out.

C. Module and Unit Overview and Purpose of Lessons 1-2 (3 min)

- Do not go into detail, but do set some purpose for the Module. You might say something like, "We are beginning a unit that explores the water cycle in general and our local watershed in particular. The author of the quote from our Entry Task has provided some basics for us to build on. She has also presented a pretty important question that we will be trying to answer over the next few lessons."
- Overview for Unit 1: "Over the next eight lessons we are going to be reading an article taken from the April 2010 edition of National Geographic Magazine. This article, "Water is Life" was written by Barbara Kingsolver, a biologist and also a very popular freelance writer. Because the article is so complex, and packed with information, we will read the article in chunks and take time to unpack her writing.
- Overview for Lesson 1-2: "In the next two lessons, we are going to read the introduction to Kingsolver's article and learn about the hydrological cycle."

3. Work Time (70 min)

A. Introduce the Interactive Word Wall (12 minutes)

- Before the lesson, write these terms on one side of an index card and the definition of the term on the other side: hydrologic cycle, hydrosphere.
- Introduce students to the Interactive Word Wall by saying something like: "One of the most important strategies to help you understand the science concepts that we will be studying over the next 8 lessons will be our Interactive Word Wall." In Earth Science, it is very hard to see everything that is going on, many of the processes that shape the earth are too big to see! So, for this Unit, we are going to use the Interactive Word Wall to collect important vocabulary to help us learn about how the hydrological cycle and the hydrosphere.
- Have students create their own cards.
- Once students have created their cards, tell them that it will be important for them to continue to create their own vocabulary cards throughout the module.
- Make sure students have a method and location to store their cards.

B. Introduce Science Notebook (3 minutes)

- Introduce the Science Notebook by saying something like this: "Science requires careful observation and documentation of ideas. Scientists study their notebooks to look for patterns and keep track of their developing ideas. This allows them to be intentional and reflective about their work at the same time. As they document observations, either through diagrams and drawings, numbers, or words, these symbols help them to make sense of the world. In this module, you will be using your Science Notebook to document your thinking, take notes, and to help you identify patterns." If you have not already done so, explain to

students the routine for noting when and how to label the pages of their notebook and other routines. If they do not have a storage place for the vocabulary cards, take the time here to have students create a pocket on the front or back cover to the notebook.

- Make sure that students know that these notebooks are intended for formative assessment (assessment for learning) purposes only. They are to be left in the classroom in a designated space so the teachers can review notebook entries to check understanding. Students need to know that their notebook is a context in which they can do routine writing to explore thoughts and connections, represent their thinking in models and diagrams, and keep track of key concepts and vocabulary and concepts. Students need to trust that their notebook will not be graded for "right" answers.

C. Viewing NASA Earth's Water Cycle Video – Building Science Vocabulary and Conceptual Knowledge (15 min)

- Prepare students to watch the NASA video, Earth's Water Cycle. This video is packed with information related to our guiding question. Introduce the video by saying something like: "In many schools, children learn about the water cycle and the properties of water in 2nd or 3rd grade. Often, once we learn something we think we "know everything" about that topic. In science, we know that is not always the case. We know that the more we know about something, the more questions we have! So to prepare ourselves for reading Barbara Kingsolver's article "Water is Life" and to review the basics about the water cycle, we are going to watch a video from NASA called 'Earth's Water Cycle.' This video is packed with information. I am going to have you create a recording form in your science notebook. We will watch this video today and again in Lesson 2. So what we do not catch in our recording forms today, we will capture then. The guiding question for this Module is "How do the properties and movements of water shape Earth's surface and affect its systems?" We are going to use this question to frame our first viewing of this video. Take out your notebooks and label the next full page as follows:
  - Place the date and time at the top of the page
  - List the name of your class and the time;
  - Place the Title of the Video on the Top of the page: Earth's Water Cycle by NASA
- "Now create a recording form that looks like this in your notebook (Model by drawing on the board or projecting your science notebook on the screen. You may engage students in helping you label the columns.)
- Define the term hydrosphere: the space under, over, and, on land where there is water.
- You will want students to use this recording form to focus their attention on where water is found and how it moves.
- At this point, you need to make sure that students understand the three properties of water – solid, liquid, gas.
- Focus their attention on recording words or very short phrases. Some examples are in the boxes to get you started. Inform students that you will be sharing terms at the end of the video.

Property	Storage on land	Storage underground	Storage in the air	Movement on land	Movement underground	Movement over land
Solid	Glaciers			Glaciers		
Liquid	reservoirs	Underground		Rivers	Underground	

		reservoirs			rivers	
Gas			clouds			Clouds

- Show Video: **Earth's Water Cycle: with narration** http://svs.gsfc.nasa.gov/vis/a010000/a011000/a011054/index.html
- Add the words student have collected on their recording forms to the Interactive Word Wall and to their Science Notebooks.
- As you capture notes, record other observations and questions that emerge from student on the **Anchor Chart** labeled **"Lingering Questions"** (see appendix). Do not answer these questions at this time. Let students know that as you unpack the Kingsolver article they will also be taking time to learn more about the science related to the hydrological cycle.
- Synthesize the conversation by creating a very simple water cycle using the terms and arrows on the Word Wall.
- Thank students for their diligence in taking notes and sharing vocabulary terms.

D. Introduce Close Reading (25 min)

- Distribute and display **"Water Is Life."** Read the first three paragraphs once aloud.
- Ask students to underline words that are related to "water" and circle words that are related to "life." Call on several students to share. (life: daughter, I, spider, heron, frogs, amphibians, snapping turtle.) (water: aqueous; irrigate, flood, drought, hurricane). Ask the question: "What do these things have in common that might help us understand the phrase "water is life."
- Define arc, aqueous, hurtle, and primordial as these words are difficult to determine from context.
- Read the 1st paragraph again, and ask students to circle words they are unfamiliar with. Prompt students to write their meanings in the column to the left, near the words. Explain that when readers encounter a word they do not know they often go word-by-word and phrase-by-phrase to make meaning of it. They paraphrase, which is to restate something in their own words, rather than summarize, because it is easy to miss details when you summarize, and the details in the images that Kingsolver creates in this text are important to understand what she is writing about. Tell students that they will do this with the phrase "Water is Life".
- Use the first sentence to model how to paraphrase and figure out vocabulary in context. You might say something like, "My daughter and I keep an eye out ….I think that means "watch"…. for wonder. Hmmm… I wonder….Ha…I said the word when thinking about the word. What did I mean…the wonder I used means to think or questions. I don't believe that is what Kingsolver meant. Let me read further to see if I can figure it out. ". . . every morning as we walk down the farm lane (road) to meet the school bus. And whenever we find them, they reflect the magic of water. Aha…that is what she means…magic, beautiful! So now I can put it together: She is saying that she and her daughter look for water and find beauty and magic when they find it!" Write this on the copy you are displaying, and also jot down your definition for wonder.
- Direct students to work with seat partners to do this for the rest of paragraphs 1 through 3.
- Refocus whole class and cold call on students to share answers, noticing and naming strategies students are

using to determine the meaning of words in context and to paraphrase a challenging text.

- As students identify central ideas in the text and key vocabulary words, script the answers on an anchor chart that is title "Ideas and Vocabulary Paragraphs 1 – 3" (see appendix). Write phrases on the document as it is projected, prompt students to correct their own worksheets so they all have an accurate reference moving forward.

E. Text Dependent Questions (15 min)

- Distribute the **"Water is Life" Text Dependent Questions – Lesson 1."**
- Tell students that another way figure out what a difficult text is saying is use questions to help you focus on specific passages.
- Post the first text dependent question, and then model how to think through the question. Explain vocabulary as necessary –and provide an answer that cites textual evidence. As you think aloud, write up your answer, and leave it so students can see a model of strong work.
    - Based on her description of the wonders that she and her daughter experience, what assumptions can you make about the relationship Kingsolver and her daughter have with water?
    - When Kingsolver describes how "water changes the face of the land", what is she talking about? What famous landmark is she describing? (Erosion – add this to Interactive Word Wall.
    - Kingsolver writes, ". . . humans understand in our bones that she is the boss." Who is 'she' and why does Kingsolver say 'she' is the boss?
    - Why is Kingsolver so concerned about flood, drought, hurricane, rising sea levels, bursting levees?
    - What does Kingsolver mean by "grave physics lesson?" How does this relate to the next sentence "hot air holds more water molecules than cold"? How can air hold water?
- Students work in pairs to answer the second and third questions, using textual evidence to support their answer.
- Return to the Interactive Word Wall and identify any words that came up in the reading that should be included on the wall.
- Congratulate students on their perseverance and close reading. Assure them that they will continue to work with this phrase and will develop a fuller understanding of the rights that are included.

4. Closing and Assessment (5 min)

A. In your science notebook, respond to the following question: Near the end of paragraph 2, Kingsolver writes a very short sentence, which is also the title of the article: "Water is life." What does she mean?

5. Homework

A. Complete definitions on personal vocabulary cards.
B. Learn about the author: Visit Barbara Kingsolver's website and read her autobiography. http://www.kingsolver.com/biography/. Be prepared to share two things about Barbara Kingsolver that has influenced her interest in water.

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