

Inquiry-Based Disciplinary Literacy Lesson for Science 2014



Carolina River Basins

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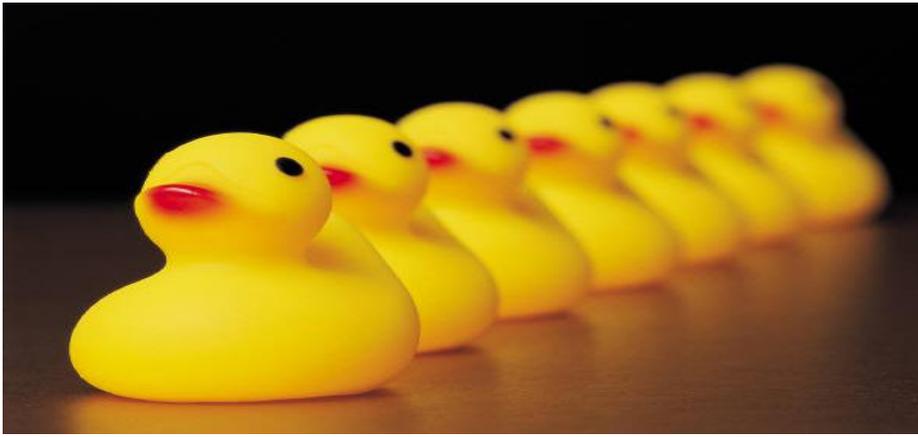
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Intro / Overview:

This is an inquiry lesson embedded in an overarching unit reading *A Civil Action* in Earth and Environmental Science with a group of 9th grade students. The lesson integrates skills from the Essential State Standards and components of the inquiry cycle specific to disciplinary literacy in science. It provides key terminology, websites, and instructional strategies that will provide teachers with an example of how disciplinary literacy functions in a science classroom. For this lesson, students are asked to explore a river basin in their state. They will then creatively synthesize into their own informational and evaluative presentation directed toward their peers.

Texts:

- *A Civil Action* nonfiction narrative on water contamination
- Fresh Water Crisis article
- NC Environmental River Basin Interactive Map
<http://www.eenorthcarolina.org/riverbasins-interactive.html>
- USGS Water Quality Data
<http://water.usgs.gov/edu/waterquality.html>
<http://waterdata.usgs.gov/nc/nwis/current/?type=quality>



Alignment to Standards

Thinking about Text Types

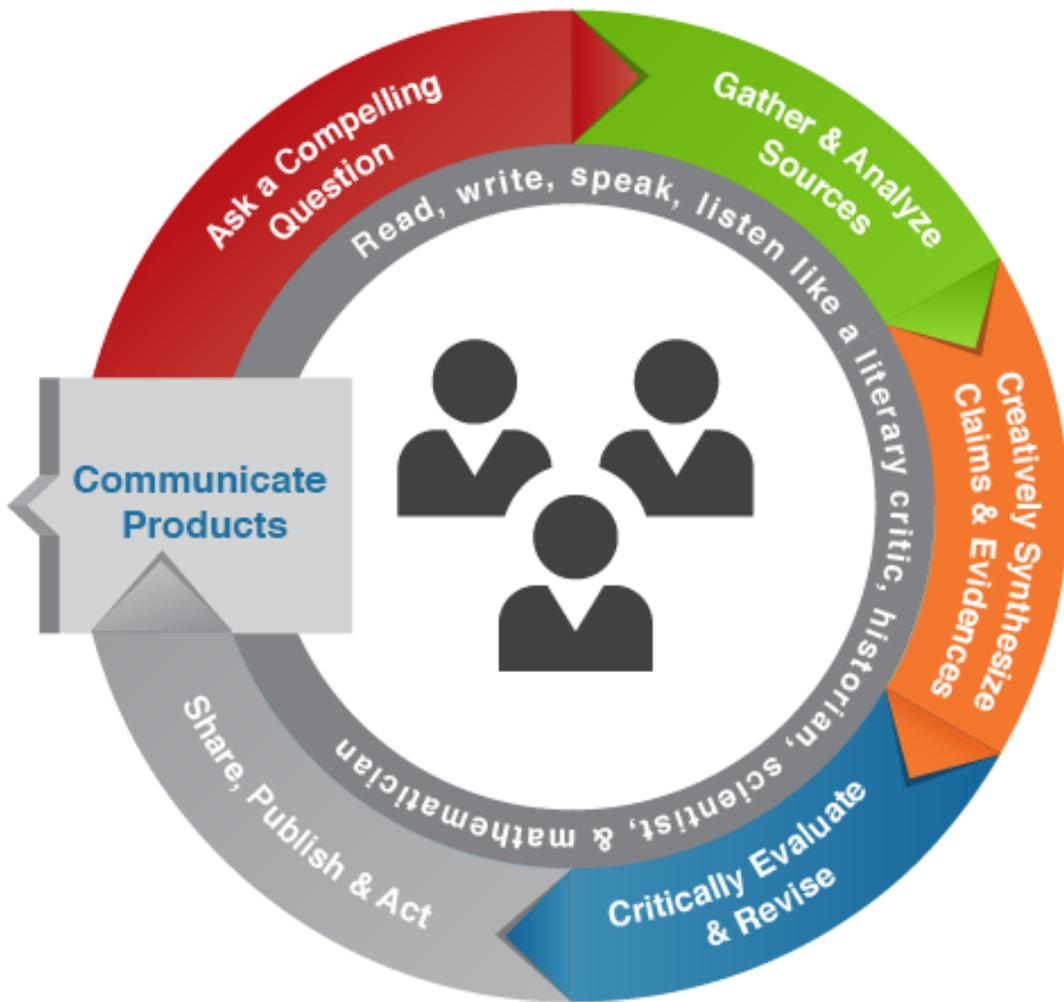
Students need opportunities to work with a variety of text types that represent high quality examples of specific genres within the disciplines. *What types of text will you use in this lesson?*

Literature	Informational Text	Periodical Article	Informational Website	Blog	Narrative	Poetry	Nonlinguistic Representation	Speech	Other
			✓		✓		✓		

COMMON CORE STATE STANDARDS FOR LITERACY in SCIENCE and TECHNICAL SUBJECTS

	9-10.1	9-10.2	9-10.3	9-10.4	9-10.5	9-10.6	9-10.7	9-10.8	9-10.9	9-10.10
Reading: Science and Technical Text	✓								✓	
Writing		✓		✓	✓	✓	✓			

The Inquiry Model





Ask A Compelling Question

Lesson #1 *The Inquiry Process*

Learning Outcomes:

Students will be able to:

- Analyze the parts of a river.
- Explore a NC river basin's structure and processes.
- Synthesize across multiple sources to create new ideas about river basins.
- Evaluate how humans use water.
- Evaluate human influences on water quality in North Carolina's river basins.
- Support claims with textual evidence to create a compelling presentation.

Ask a Compelling Question:

For this lesson, the inquiry question is teacher developed. Students will choose which river basin to study.

- How do humans influence water pollution in North Carolina's river basins?

Domain- Specific Vocabulary:

Hydrosphere,
Water quality

Directions

Hook:

- Teacher will project the Compelling Question. In order to show importance of the question, the class will review the Moburn, MA case.
 - Give students 2 minutes to predict water quality in NC.
 - Discuss and share predictions as a class.

Activity:

- Explain the inquiry method and the question.
 - Students will be thinking about how humans influence water quality throughout the inquiry process.
 - Show students the model on page 3. Explain that in different disciplines, we conduct investigations a little bit differently.
- Students will create a free online journal at penzu.com to keep a research journal and record ideas during the inquiry process.

Closing:

- Students can ask any questions they have about the inquiry process.

When you read, write, speak, and listen like a scientist:

Ask a Compelling Question	
Gather & Analyze Sources	<ul style="list-style-type: none"> ▪ Read original research sources, e.g., lab reports, scientific journal articles. ▪ Determine author's credentials & authority within a field; analyze rigor of methods. ▪ Understand technical terms, essential characteristics, & abstract concepts. ▪ Look for negative space in order to generate hypothesis.
Creatively Synthesize Claims & Evidences	<ul style="list-style-type: none"> ▪ Organize by topic, e.g., physical, life, earth. ▪ Interpret data & analyze relationships of variables. ▪ Aim for consensus in scientific community. ▪ Construct models & explanations to support scientific hypothesis or design solutions.
Critically Evaluate & Revise	<ul style="list-style-type: none"> ▪ Monitor by reflecting on own bias; convey objective attitude & informed skepticism; determine generalizability. ▪ Determine if claims are supported with adequate textual evidence. ▪ Revise for validity & replicability. ▪ Represent response in multiple formats, e.g., prose, diagrams, models, equations, tables.
Share, Publish & Act	

The Inquiry Process for Science

“Science at its best is an open-minded method of inquiry, not a belief system.”

— Rupert Sheldrake



Gather & Analyze Sources

Lesson #2 Locating Textual Evidence

Hook:

Watch the video on the home page of <http://water-alliance.org/>. Explain that the video gives important points but not specific facts backed up by textual evidence.

Activity:

Explicit Instruction

Teacher gives Prezi on parts of a river and the water cycle process. For each set of facts, the teacher goes to the original webpage and shows students where the information came from and shows how she knew the sources were reliable. Teacher gives explicit instruction on locating textual evidence from reliable sources:

- Reliable sources
 - Credentials of author
 - Funding source is disclosed and isn't a conflict of interest
 - Most recent data
 - Convergence with scientific consensus
 - Valid and reliable evidence
- Types of textual evidence
 - Experiment results
 - Observations that used scientific method
 - Statistics
 - Scientific consensus as a fact

Domain-Specific Vocabulary:

River basin
Headwaters
Tributaries
Watershed
Discharge
Precipitation

Guided Practice

In small groups, the students read the article on page 7. The students determine if the source is credible by following the link and supporting their decision with evidence from the webpage. The students then read the article and highlight the textual evidence: pink for experiment results, yellow for observations, orange for statistics, blue for scientific consensus as fact.

Independent Practice

Students will explore a river basin of their choice using the NC Environmental River Basin Interactive Map. The students will also explore the links given by the website at the bottom of each River Basin webpage. Students will analyze data on the USGS Interactive Real-Time Data Map linked below and explore the USGS website <http://water.usgs.gov/edu/waterquality.html>. Students must analyze one additional reliable source for the presentation.

NC Env. River Basin Map <http://www.eenorthcarolina.org/riverbasins-interactive.html>
USGS Interactive Real-Time Data Map <http://nc.water.usgs.gov/realtime/>

Freshwater crisis – why it matters

Posted in [Clean Water Crisis](#)

By the Clean Water Alliance

Although nearly 70 percent of the globe is covered by water, environmentalists and specialists all over the world constantly talk about water crisis. That is because only 2.5 percent of all the water on earth is fresh water, the rest of it being ocean based and saline. Furthermore, out of those 2.5 percent, only 1 percent can be easily accessed, the rest being trapped in snowfields and glaciers. If you make a simple mathematic calculus, you will see that, basically, only 0.007 percent of the water on our planet is available for 6.8 billion people. That is what constitutes a crisis. The water we drink has been present on this earth for hundreds of millions of years, in one form or another, being continuously recycled through the atmosphere. Therefore, the amount of freshwater has remained somewhat constant, while the population of the planet exploded. To that extent, as years go by, the competition for clean water, better yet a sufficient supply of clean water for drinking, maintaining a proper hygiene or even sustaining life growth more and more intense.

Because water scarcity is an abstract concept to a large part of the world's population, few people realize why freshwater crisis matters, except of course for those who live in that stark reality. However, the extent of its importance is quite simple: water is life. Geography and climate, but also the competition for resources, engineering and regulations have made it so that some parts of the planet enjoy great supplies of freshwater, while others have debilitating pollution and drought. But people need water to survive, not just in the sense of drinking water, but also clean water for cooking, hygiene needs and also keeping the environment clean.

In Africa, 4,000 children die every year from diarrhea, because they have no hygienic toilets and clean water to wash their hands. A simple condition like diarrhea, which could be easily fixed if there were a supply of clean water, kills more children than diseases like AIDS and malaria. The man has proven to be an inefficient water users, spending about 2,400 liters of clean water to produce a hamburger and growing water intensive crops, like cotton, in arid regions.



The freshwater crisis matters not only from today's perspective and the fact that people in developing countries are practically dying from clean water scarcity, but also because the future looks grim. Estimations show that by the year 2025, water scarcity will affect about 1.8 billion people and two thirds of the world will be living in water stressed regions. So humans now face another challenge, that of effectively conserve and manage water resources, as well as distributing the supplies of fresh water we have, especially since solutions are greatly affected by climate, policy, technology and people alike. Nevertheless, it is important to remember that freshwater crisis is a global issue and it matters or it should matter for everybody, even though some parts of the world enjoy a flush of clean water supplies at the moment.

Clean Water Alliance. Retrieved from:

<http://www.cleanwateramericaalliance.org/category/clean-water-crisis/>



Creatively Synthesize Claims & Evidences

Lesson #3 *Facts and
Opinions*

Activity Prompt:

Using the inquiry question to guide your thinking, give a Prezi presentation to your peers about a river basin in NC.

Your presentation should address all of the following questions:

- What is the name of the river basin you chose?
- What counties does it affect?
- How long is the basin?
- How do humans use water in this basin?
- What is the water quality of this basin?
- How do humans influence the water quality of this river basin?

As you write remember to:

- Consider the purpose and audience for your presentation.
- Be sure to clearly state your claims.
- Support your claims with textual evidence.

Brainstorming:

Have students create a Fact | Opinion chart to make sure that the students have both the information and argumentation parts of the assignment. Then, have students draw a line to a fact that supports each of their opinions. If there is not a line, students need to do more research to support their opinions.



Directions

- Students self-evaluate using rubric.
- Experts in the field evaluate using rubric and give feedback to students.
- Students make revisions

Critically Evaluate & Revise

Lesson #4 Quality Control

Rubric for Presentation: How do humans influence water pollution in NC's river basins?

CATEGORY	4- Above Standards	3 – Meets Standards	2 –Approaching Standards	1 – Below Standards	Score
Informs Audience	Demonstrates a clear understanding of the audience. Informs the audience on the important facts of the topic. Defines terminology as needed.	Demonstrates a general understanding of the potential audience and uses important facts appropriate for that audience.	Demonstrates some understanding of the potential audience.	The terminology and facts are way below or way above the education level of the audience.	
Statement of Claim	The position statement provides a clear, strong statement of the author's position on the topic.	The position statement provides a clear statement of the author's position on the topic	A position statement is present, but does not make the author's position clear	There is no position statement.	
Textual Evidence	All of the evidence and examples are specific and relevant. Explanations are given that show how each piece of evidence supports the author's position.	Most of the evidence and examples are specific, relevant and explanations are given that show how each piece of evidence supports the author's position.	At least one of the pieces of evidence and examples is relevant and has an explanation that shows how that piece of evidence supports the author's position.	Evidence and examples are NOT relevant AND/OR are not explained.	
Sources	All sources used for evidence are credible and cited correctly. The author cites at least three readings from class.	All sources used for evidence are credible and most are cited correctly. The author cites at least two readings from class.	Most sources used for evidence are cited correctly. The author cites at least two readings from class.	Many sources are suspect (not credible) AND/OR are not cited correctly. The author cites less than two readings from class.	



Share, Publish & Act

Lesson #5 *Take a
Stand*

Directions

After students have revised and polished their presentations, they will share their Prezis with the community of that river basin by posting a link to the Prezi on the students' own Facebook or Twitter or on one of the options below.

The teacher will encourage students to continuously engage in the conversation about water pollution in NC through social media.

- Twitter
 - @environmentNC
 - @CleanWaterforNC

- Facebook
 - North Carolina Earth Share
<https://www.facebook.com/EarthShareNC>
 - Help Preserve North Carolina Environment
<https://www.facebook.com/environmentnorthcarolina>
 - Piedmont Environmental Alliance
<https://www.facebook.com/peanc>
 - Southern Environmental Law Center
<https://www.facebook.com/southernenvironment>

by
Brooke Clemmons and
Shea Kerkhoff